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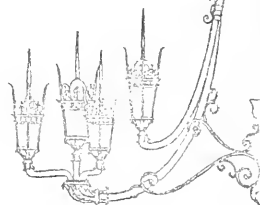
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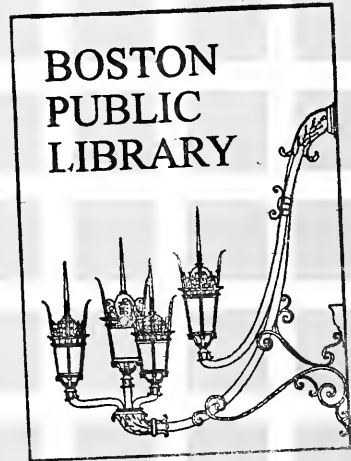
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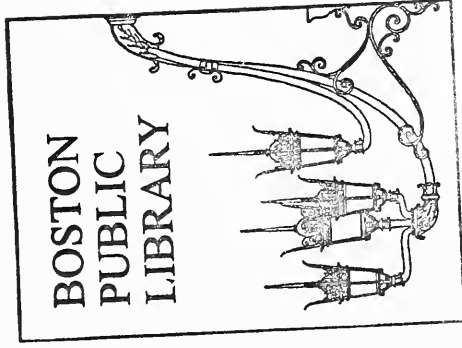
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PRUDENTIAL CENTER REDEVELOPMENT



April 12, 1989

submitted to:
The Boston Redevelopment Authority
Massachusetts Executive Office of Environmental Affairs
Executive Office of Environmental Affairs Number: 7208

Carr, Lynch, Hack and Sandell
Sikes, Jennings, Kelly & Brewer

submitted by:
The Prudential Property Company, Inc.
for The Prudential Insurance Company of America

DRAFT PROJECT AND ENVIRONMENTAL IMPACT REPORT
Volume II: Urban Design Alternatives

DRAFT PROJECT AND ENVIRONMENTAL IMPACT REPORT

PROJECT

Prudential Center Redevelopment
Boston, Massachusetts

DEVELOPER

The Prudential Property Company, Inc., for
The Prudential Insurance Company of America

STATUS OF PROJECT

The developer submitted a Project Notification Form to the Boston Redevelopment Authority (BRA) and an Environmental Notification Form to the Massachusetts Executive Office of Environmental Affairs (EOEA) on June 29, 1988. Scoping letters were issued to the developer by the BRA and EOEA on September 1, 1988. The EOEA number is 7208. The project is in pre-schematic design stage. Master plan approval is being sought.

BRIEF DESCRIPTION OF THE PROJECT

The project includes the addition of new offices, retail spaces and housing to the current Prudential Center site. New housing and offices, with retail uses at their base, will be constructed principally along the Boylston Street, Huntington Avenue and Belvidere Street frontages. The current retail area will be reconstructed and expanded with indoor pedestrian passageways. Enclosed pedestrian routes will provide connections between Boylston Street and Huntington Avenue, and between Copley Place and the south entrance of the Hynes Convention Center. A system of public squares, a wintergarden and outdoor open spaces will be created as amenities for those using the center and

adjacent neighbors. A neighborhood commercial area, including an expanded super-market, is proposed for Huntington Avenue and East Ring Road. East Ring Road will be improved to facilitate pedestrian flows to the shopping area. The existing parking garages will remain approximately the same size, but their capacity will be expanded by approximately 800 spaces through changes to their management.

ALTERNATIVES CONSIDERED

Two basic planning approaches have been considered for the site, and for each three scales of building program have been analyzed. Alternative A proposes two new office structures along Huntington Avenue and principally housing, with a small office structure, along Boylston Street. Alternative A2 has housing as well as offices along Huntington and housing, along with expanded offices, along Boylston. The form of structures, their heights, and the organization of pedestrian routes also vary between these two basic alternatives. Alternatives B and B2 are similar in configuration, respectively, to Alternatives A and A2, but the overall development totals 10 percent less area. Alternatives C and C2 follow the same outlines, but are 20 percent smaller in area than Alternatives A and A2. In the course of preparing these plans, a large number of other design and functional alternatives were considered and rejected as less desirable.

DRAFT PROJECT AND ENVIRONMENTAL IMPACT REPORT

DEVELOPMENT PROGRAM

The three basic levels of program studied are, as follows:
(000 FAR gross sq. ft.)

Use	Alternatives A and A2	Alternatives B and B2	Alternatives C and C2
Offices	1,009	865	811
Residential	404	378	324
Retail	268*	210*	160*
Total Areas	1,681	1,448	1,295
Plus Indoor Pedestrian Areas	153**	153**	103**
TOTAL PROGRAM	1,834	1,601	1,398

* In addition, 143,000 gross sq. ft. of existing retail is demolished and rebuilt.

** Areas vary slightly between alternatives.

DEVELOPMENT SCHEDULE

The project is planned as a number of separate phases to be completed over a 10 year period. Construction will begin on the south side of the site, moving to the north. Phases along Huntington Avenue should be completed by 1994, with the Boylston Street area completed by 1999.

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- IA: Summary Appendix
- II: Urban Design Alternatives
- III: Transportation Access Plan
- IIIA: Transportation Access Plan Appendix
- IV: Environmental Impacts
- V: Wind Impacts
- VA: Wind Impacts Appendix
- VI: Infrastructure Systems
- VII: Housing Impacts
- VIII: Public Benefits
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1. INTRODUCTION

In preparing the alternatives which are considered in this environmental and project impact analysis, a number of aspects of the Prudential Center site were studied in greater detail than are able to be conveyed in Volume I: Summary. This volume indicates the considerations behind the urban design studies and expands upon the general description of the alternatives provided in Volume I: It should be read with Volume I in hand.

The urban design issues examined include building forms and heights, pedestrian level amenities, entrances to the Center, service and access patterns, the character of pedestrian ways through the site and streetscape patterns. Studies of each of these issues were specifically requested by the Boston Redevelopment Authority in its scoping determination, or by PruPAC members.

This report points out the considerations which must be weighed in deciding each of the issues, and the pros and cons of the alternatives. Since the choices which must be made are often linked to other choices, they must be seen in context. In the spirit of the current analyses, the report refrains from making recommendations.

The objective of this stage of the project is to decide upon the master plan for redeveloping Prudential Center. Thus, the urban design studies aim at informing decisions about form, massing and locational issues. They stop considerably short of the detailed landscape and architectural design of individual projects. The detailed design of the individual projects will occur over time, by architects and landscape architects appointed to carry out each of the phases of the project, guided by the master plan. Thus, the studies probe the general approaches to the design of buildings and open spaces in the interest of agreeing upon the ground rules for design.

2. BOYLSTON STREET STUDIES

2.1 Street Wall

Boylston Street is currently a one-sided street across the Prudential Center frontage, the result of the Center's original plan which created a distributor road (the North Ring Road) parallel to the street. While this road was originally part of a system of ring roads on the site, its purpose has been eroded by eliminating a portion of the road through the extension of the Hynes Convention Center. There is now an opportunity to create a two-sided street pattern through developing the 95 foot deep parcel between the north property line of Prudential Center and the edge of the parking deck.

Figure 1: 155 Foot Stepback Height

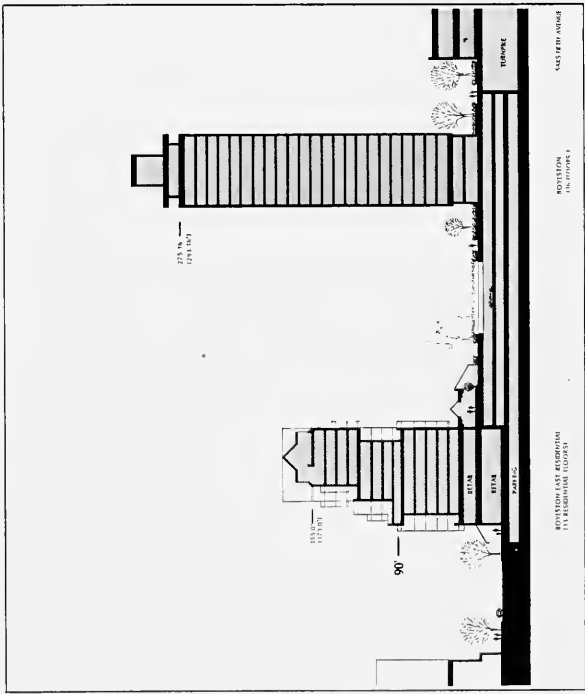
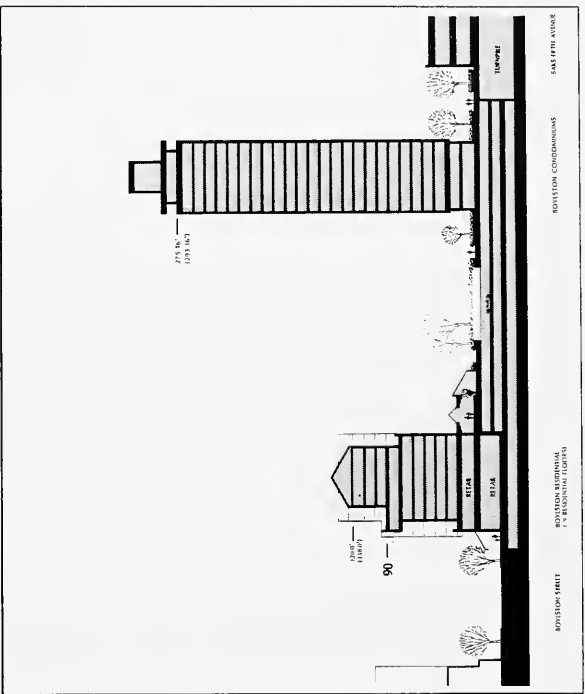


Figure 2: 120 Foot Height



The height of street wall along Boylston is an important issue from both the perspective of streetscape and the scale of the residential courtyard south of new development along the street. We have studied two possible heights for new development: 155 feet and 120 feet. The 155 foot height (shown on Figure 1) would correspond to the enhanced Interim Planning Overlay District (IPOD) height limitation which applies to the majority of the Prudential Center site. However, at the street line, the street wall of new structures would be only 90 feet, approximately the height of the Hynes Convention Center. Above this line, the structure would be stepped back in two stages, to minimize the apparent height on the street. Figure 3 indicates how structures at this height might appear looking east along Boylston.

A structure of 120 feet in height is shown on Figure 2. This height corresponds to the permanent zoning for this portion of Boylston Street. Figure 4 indicates the possible

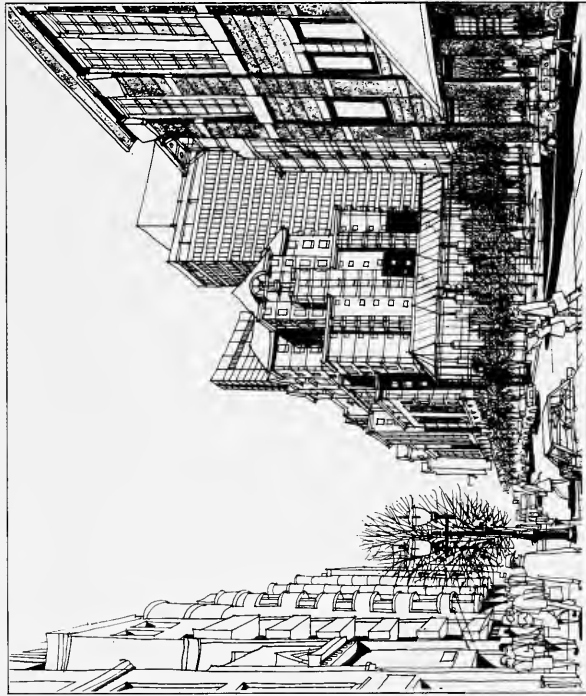


Figure 3: Perspective 155 Foot Stepback Height

appearance of structures of this height, as incorporated in Alternative A2. As with the taller structures, the apparent height of the structure would be 90 feet, with higher portions stepped back.

Buildings on the opposite side of Boylston Street from the proposed housing are enormously varied in height, with several properties likely to be redeveloped in the future. Height limits on this portion of the north side of Boylston Street are 90 feet. However, the Ingalls Building is 157 feet, the Grant Hoffman Building is approximately 95 feet and Exeter Place is 165 feet. On the south side of the street, the Lenox Hotel is 125 feet and the Hynes Convention Center is approximately 90 feet. Thus, at 155 feet, the new structures would be within the range of taller structures along the street, although less visible to pedestrians because of setbacks, and at 125 feet they

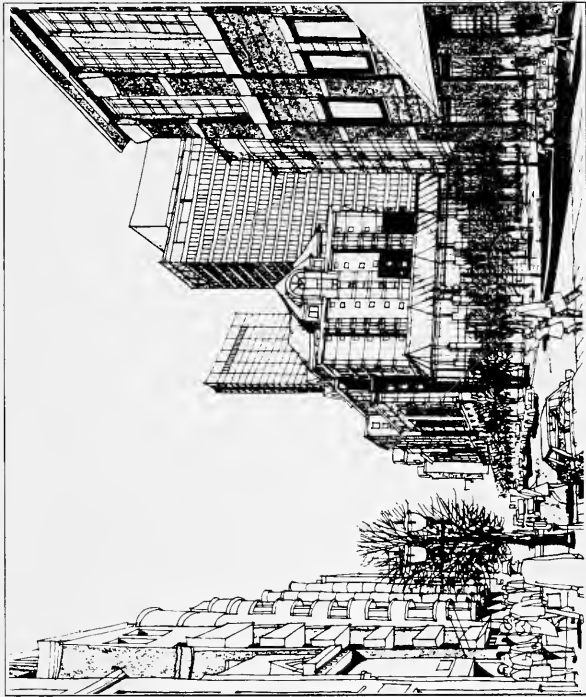


Figure 4: Perspective 120 Foot Height

would be similar to the next lower tier of buildings. In both cases, the street wall would be within the desirable norm of 1 to 1.5 street width to average street wall. In the future, as the north side of the street is redeveloped at 90 feet, a street wall of equal height on the south side should result in a street with pleasant proportions.

From the perspective of the residents of the Boylston Apartments, the lower building height would block distant views for fewer floors. Currently, there are views to the Charles River from the 14th floor and above. With a 125 foot structure, no views to the river should be obstructed; with a 155 foot structure, views to the river from 2-3 floors would be obstructed. The distance between the new housing and the Boylston Apartments would be approximately 200 feet, far enough to obviate any concerns for privacy. That distance is about the same as the dimension from face to face across Commonwealth Avenue.

The most significant impact of the lower building height would be the diminished number of housing units, or reduced floor area of offices which could be built along Boylston Street. Alternative A, which incorporates 155 foot housing structures, would allow 300 housing units to be constructed across the Boylston Street frontage. A simple reduction to 120 feet would lower the number of units possible with the same footprint to less than 200. Unfortunately, the limited depth of the parcel does not permit larger footprints or more complex configurations that might allow some of the units that are lost through height reductions to be recouped. Hence, unless housing is located elsewhere on the site, lower heights along Boylston Street will inevitably mean fewer new residential units.

2.2 Pedestrian Level

The PNF proposal for Prudential Center incorporated a continuous two story arcade along the face of Boylston Street. In its scoping letter, the BRA requested that a configuration without an arcade be examined, and that wider sidewalks be provided. The BRA has argued that, since there are no similar arcades in commercial structures along the length of Boylston Street (the Hynes Convention Center does have such an arcade), introduction of an arcade in this location would be out of character with the street.

Figures 5 and 6 compare the Boylston Street frontage with and without an arcade. As Figure 5 shows, a 15 foot sidewalk would be supplemented by a 15 foot arcade, with new structures constructed along the property line. Without an arcade, the structures

Figure 5: Boylston Street With Arcade

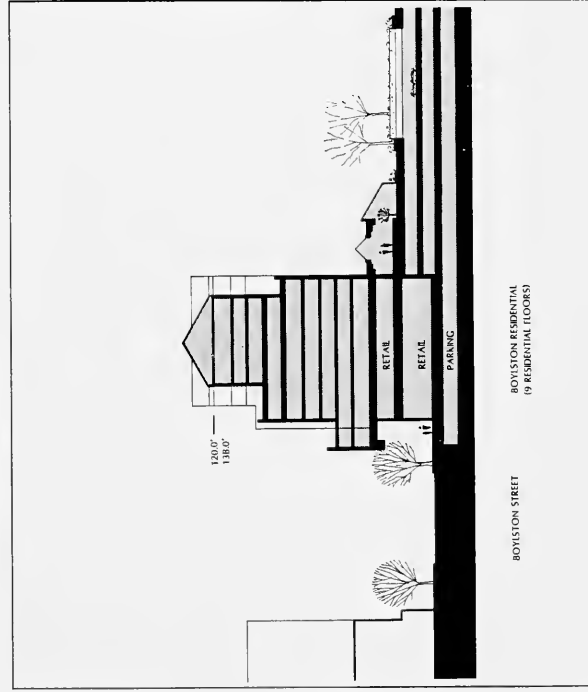
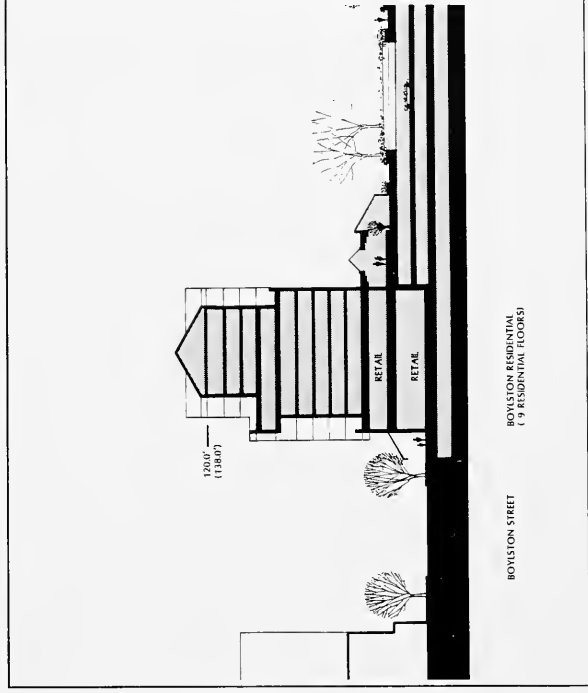


Figure 6: Boylston Street Without Arcade



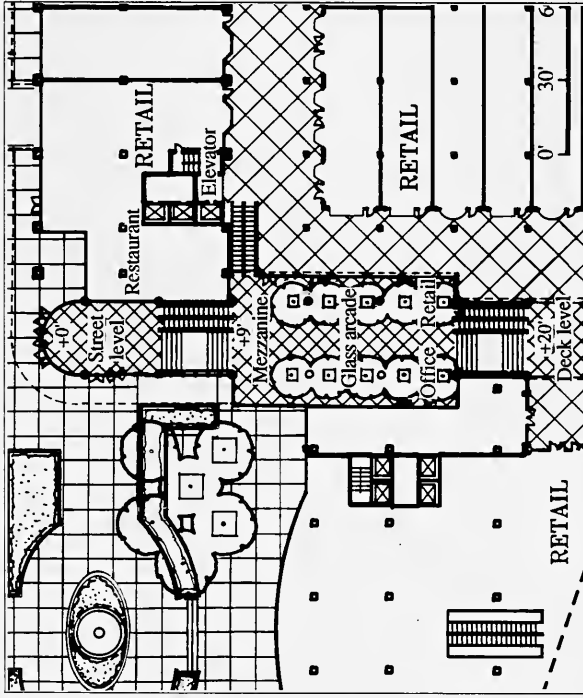


Figure 7: Alternative A Entrance Plan

would be set back 15 feet, resulting in a 30 foot sidewalk. If no arcade were constructed, weather and wind protection could be achieved by canopies along the length of the street.

One advantage of locating buildings with arcades along the street line is that structures could have larger footprints above their arcades. Typically, the distance from the Boylston Street property line to the edge of the three level parking structure is 95 feet, a limited dimension. An important objective in planning the redevelopment of the Prudential Center site is avoiding the demolition of the three level deck, a move that would not only be costly but would also seriously disrupt the functioning of the existing complex.

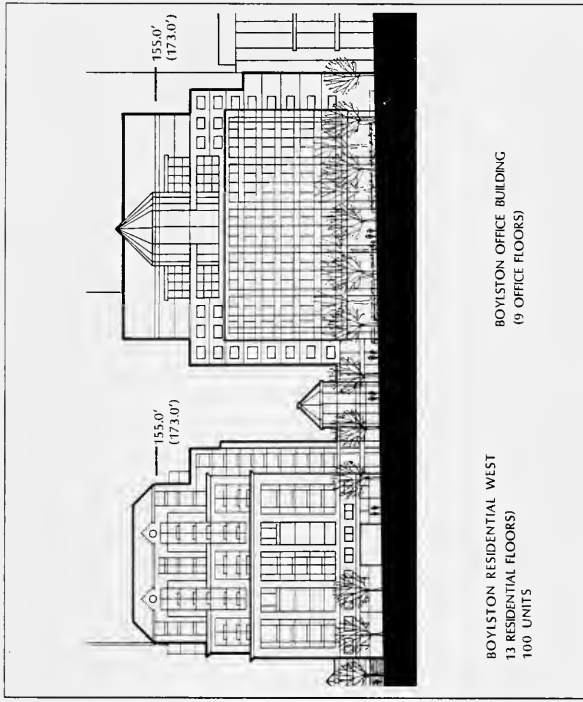


Figure 8: Alternative A Entrance Elevation

While maximizing the building depth would be a distinct advantage if offices were located along the Boylston Street, with housing located there, little would be gained. Since there are a limited number of interior spaces in apartments which may be located more than 15-20 feet from exterior windows, typical housing structures are 65 feet in depth. Therefore, even with a 15 foot setback to the face of the housing, and with 15-20 feet devoted to modelling of the facade, an adequate dimension would remain for housing structures along the street without demolishing the three level portions of the parking deck.

From a streetscape and pedestrian standpoint, a 30 foot sidewalk would provide considerably more flexibility than a narrower sidewalk with arcades. The larger distance would allow trees of some scale to survive without touching adjacent

structures. A 30 foot walkway would offer the potential for seating or waiting areas, as well as a generous dimension for pedestrian flow. North facing arcades tend to be dark and uninviting. On the other hand, the weather protection provided by the arcade is essential to pedestrians, since structures along Boylston have the potential of drawing winter northwest winds down to the street. Thus, in substituting greater setbacks for arcades, the introduction of canopies would be an essential requirement.

Several possible arrangements for the Boylston Street entrance to the complex were studied. The two most promising directions were incorporated in Alternatives A and A2, and they are illustrated in Figures 7 through 12. The two approaches reflect a fundamental tension: the desire to create an entrance which is as visible and inviting as possible to passersby, on the one hand, and on the other, the desire to keep a

continuous street wall broken only by the proposed plaza adjacent to the Hynes Convention Center. Alternative A emphasizes the drama of entering the Center by breaking the street wall. Alternative A2 downplays the entrance in favor of a continuous street wall and celebrates the arrival in the pedestrian zone.

As Figures 7-9 indicate, Alternative A would extend the glass roof over the upper level walkway directly out to the street, terminating it in a glazed semi-circle that is visible and inviting to those passing by. The sense of the street would also be extended inward to an intermediate level walkway landscaped with similar materials to the Boylston Street frontage. Pedestrians would rise up to the deck in stages, first a rise of 9 feet to the intermediate level, then later a rise of 11 feet to the main pedestrian level of the Center. On each level — street, intermediate, and deck — the pedestrian ways would be lined with retail uses.

Figure 9: Alternative A2 Entrance Plan

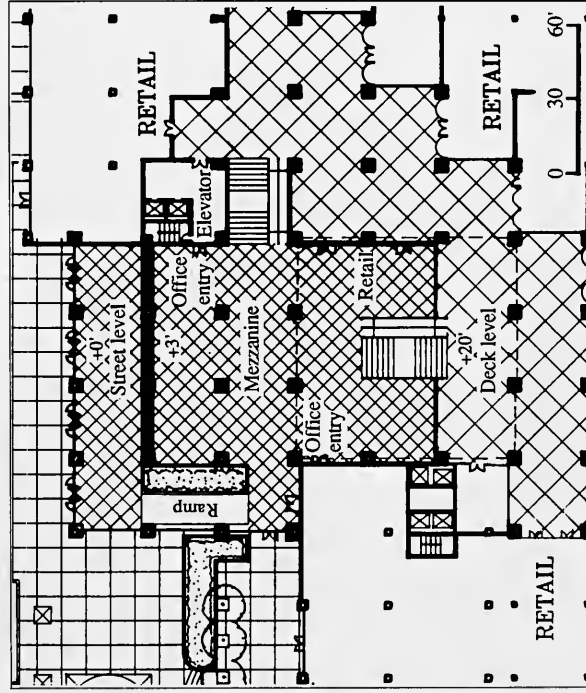
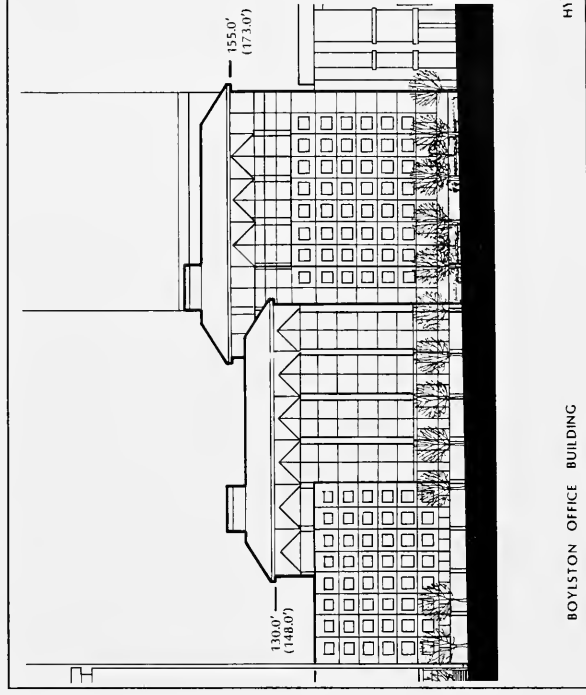


Figure 10: Alternative A2 Entrance Elevation



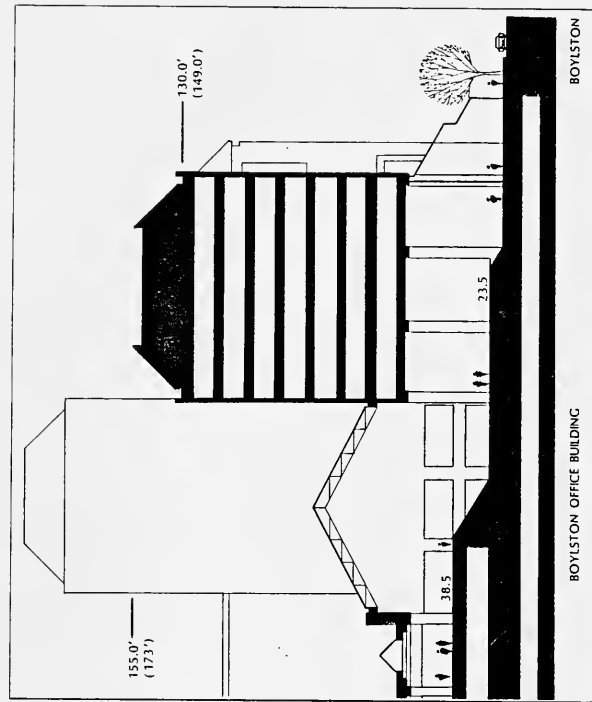


Figure 12: Alternative A2 Entrance Section

From the standpoint of exposing retail uses in the Center to those passing by, Alternative A would create more of a sense of excitement on the street and probably would be more successful in drawing pedestrians into the Center. It would celebrate the transition in height rather than deemphasize it. Alternative A2, on the other hand, would create an office structure on Boylston Street which has much more flexibility in terms of leasing, because of its larger floor areas.

At the street, the presence of the entrance would be marked by a glass canopy reminiscent of the entrance to the Hynes Convention Center. The entrance would seem to be an extension of the street level plaza, not a separate object. As Figure 11 indicates, this approach would emphasize the continuity of open space near the street level, rather than moving pedestrians directly to an intermediate level.

2.3 Relationship to Fairfield Apartments

The frontage from East Ring Road to the edge of the Hynes Convention Center is nearly 800 feet in length, much longer than typical city blocks. Even with a plaza east of the Hynes entrance, it makes sense to break the street wall in at least one additional location. The PNF showed such a break opposite Fairfield Street as shown on Figure 13. A second option, shown on Figure 14, would be to break the street wall slightly further west, in line with the north face of the Fairfield Apartments.

Each scheme would have virtues, but also disadvantages. By breaking the street wall opposite Fairfield Street, views up the street would continue onto the Prudential site, reducing the sense that Prudential Center is a break from the adjacent Back Bay pattern.

However, views from the north end of the Fairfield Apartments would be blocked by a building wall 30-40 feet away, seriously compromising residents' privacy as well. The pattern shown on Figure 14, which aligns the break with the end of the Fairfield Apartments has just the opposite effect, allowing views from the end of the Fairfield apartments to remain unobstructed. It also aligns the secondary entrance with the crosswalk across Boylston. However, it decreases the size of the parcel to the west of the break, which significantly limits its value as a site for offices, although it remains a viable housing parcel.

On balance, it appears that the pattern shown on Figure 14 is the most desirable, and it has been incorporated in each of the alternatives.

Figure 13: Gap Aligned with Fairfield Street

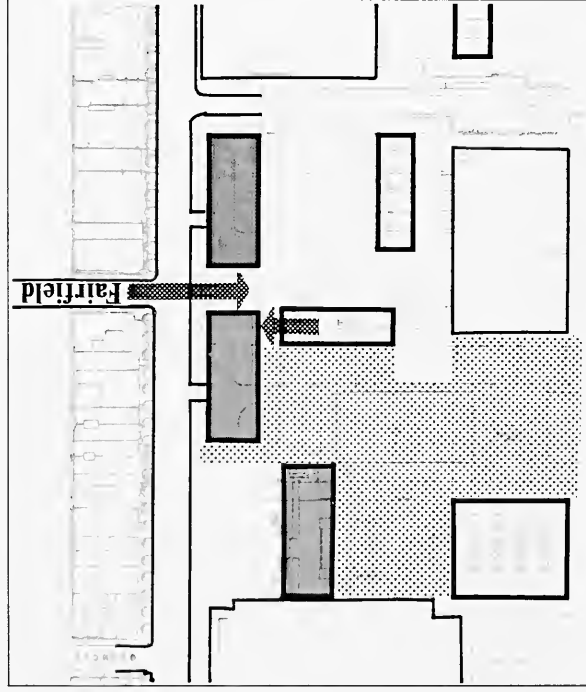
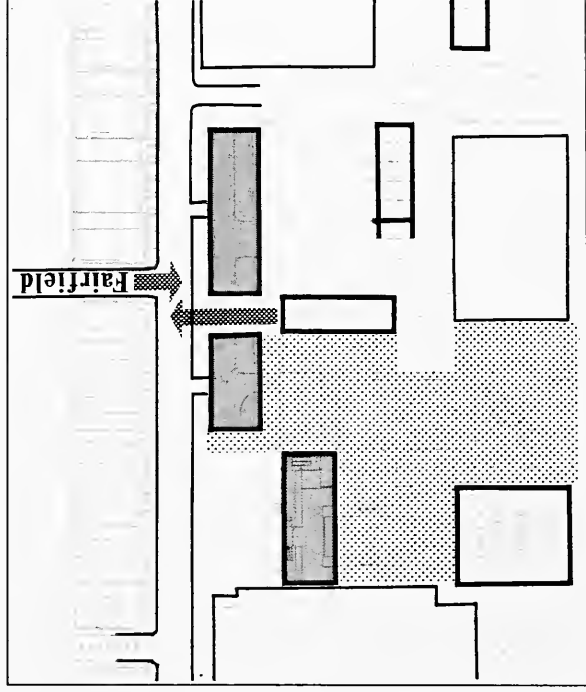


Figure 14: Gap Aligned with End of Fairfield Apartments



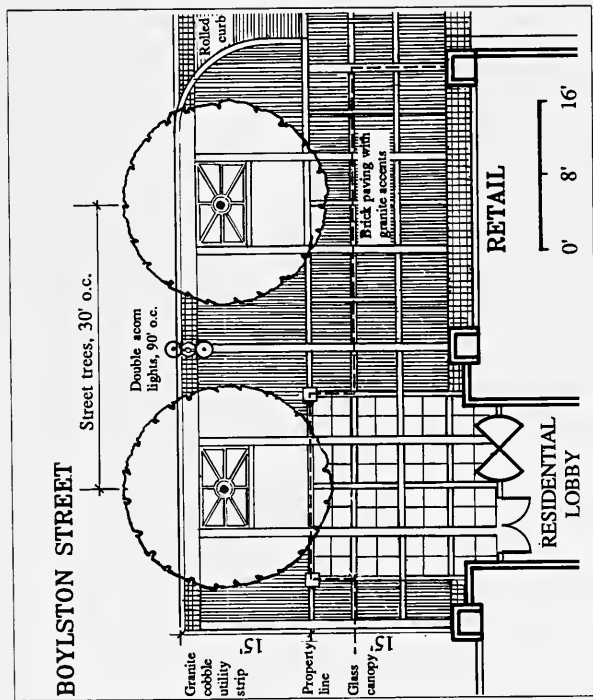


Figure 15: Typical Boylston Streetscape Plan

2.4 Streetscape

Prototypical streetscape standards have recently been prepared for the full length of Boylston Street by consultants for the City of Boston. The proposed pattern for Prudential Center, shown on Figure 15, adapts these standards to the particular conditions of this site.

The typical surface materials would be brick paving accented by granite strips spaced at 5 or 10 foot intervals. Along the curb there would be a granite cobble utility strip, as there would be along the face of retail display frontages. Where residential or office lobbies meet the street, the interior floor material, or a similar material, would be extended out 15 feet, substituting for the brick pavers, marking the entrance zone. At

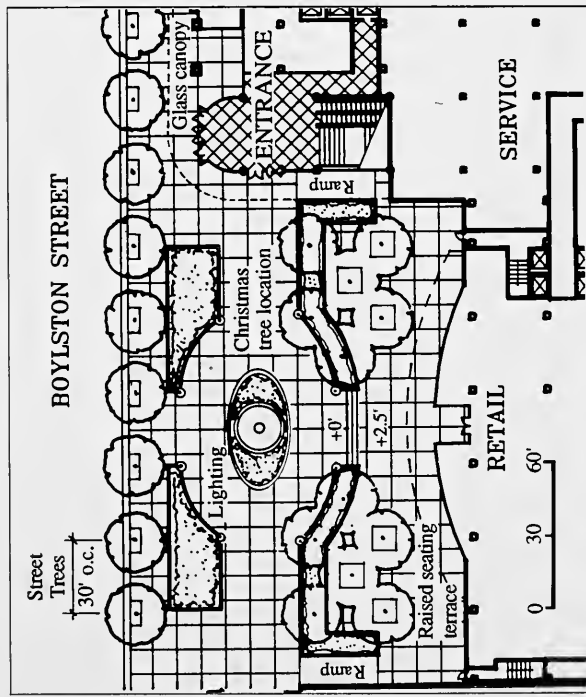
driveways, granite rolled curbs would mark the transition, yet would give drivers the clear sense that they were crossing a main pedestrian route. Tree grates would complete the palette of surface materials.

Shade trees would extend continuously along the street at 30 foot intervals, broken only by the obvious requirements of driveways. A glass canopy of 10-15 feet would provide weather protection for pedestrians. At residential or office building entrances, the canopy would extend further out into the street, creating a weather protected zone for waiting. Between street trees, located on 90 foot intervals, double acorn lights will provide even illumination for pedestrians, and reinforce the boulevard quality of the street.

The most important event along the Boylston Street frontage will be the Boylston Plaza, located between the new entrance to the Prudential Center and the Hynes Convention Center. The plaza will provide an opportunity for informal gathering and programmed events. Two possible designs for the plaza are shown on Figures 16 and 17, corresponding to Alternatives A and A2, respectively. While the designs have many things in common, they differ subtly in response to the differing configurations of entrances located beside the spaces.

Since the south edge of the plaza is likely to be in shade much of the time, its life and animation will need to flow from the bordering retail spaces. We envision a raised seating terrace, capable of being an outdoor restaurant in summer coupled with an adjacent retail use, or a passive seating area for pedestrians spilling out of the Hynes

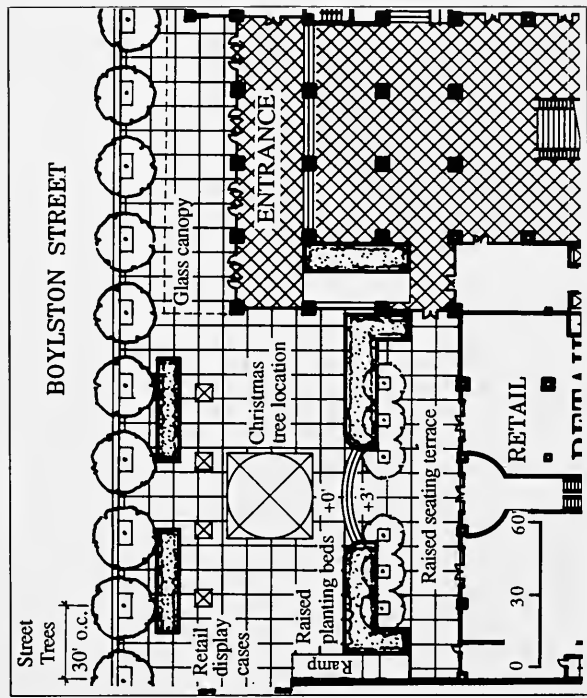
Figure 16: Alternative A - Boylston Plaza



Convention Center or the Prudential Center. Raised 2.5-3 feet above the street, the terrace will provide a vantage to overlook street activity. On the lower level of the plaza, a centered space would provide a location for the annual city Christmas Tree, and in summer a place for special floral displays or a stage for events. There is an opportunity for raised planting beds along the street, to divert pedestrians through the plaza, and for retail display cases which signal some of the retail opportunities in the new Prudential Center.

With Alternative A2 (Figure 17), the raised seating terrace would connect directly with the intermediate entrance level, while in Alternative A, pedestrians would reach the intermediate level via the enclosed glass entrance at street level. Ramps will provide wheelchair access to the raised terrace on either scheme.

Figure 17: Alternative A2 - Boylston Plaza



3. HUNTINGTON AVENUE STUDIES

3.1 Alternative Tower Configurations

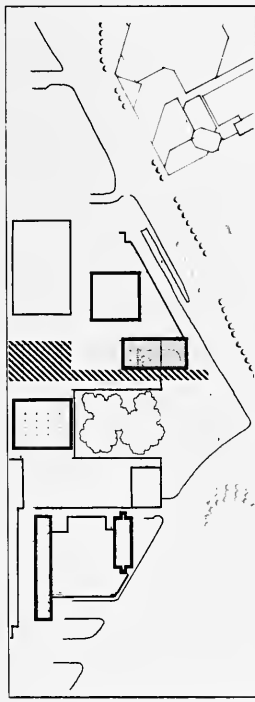
The Huntington Avenue-Belvidere Street triangle was the subject of many studies, each attempting to reconcile the several competing objectives for the area. This area represents the largest potential site for new development, but there are also many influences on its form and mix of uses.

Through discussions with the BRA and PruPAC, from analyses of costs and physical restrictions of the site, a large number of objectives have emerged for the Huntington-Belvidere triangle. Some are contradictory, others are compatible, and together they suggest a large number of ways of organizing this area of the site. Included are the following 16 objectives:

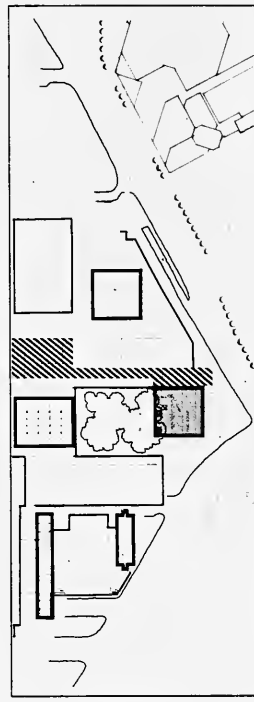
- Development should avoid penetrating the three story parking deck, if at all possible, to minimize costs and disruption to existing systems, foundations and infrastructure. If not possible, the area to be demolished should be minimized and should be a regular shape.
- Relocation of the existing loading dock should be avoided.
- The Boston Edison Control Center should not be disturbed.
- Building configurations should avoid obstructing sunlight to open spaces south of the existing Prudential Tower, particularly from 12-2 p.m. in spring, summer and fall.
- The area of outdoor open space should be maximized.
- The north-south pedestrian way should be as direct as possible from Huntington to Boylston.
- There should be a clear sense of entrance to the north-south pedestrian way from Huntington Avenue.
- The transition from the street level to the deck level should be gradual, preferably with an intermediate level.

- Buildings should create a street wall along Huntington Avenue that is in scale with structures on the south side of the street.
- The 155 foot IPOD height limit should be respected as much as possible. Where taller structures are necessary, they should be set back from the street as far as possible.
- The axis along the Christian Science Plaza should be reflected in the massing of structures.
- An outdoor gathering area should be provided around the entrance to the Prudential subway station.
- Tall structures should be located as far as possible from 101 Huntington, to assure privacy and decrease the sense of a wall of tall structures.
- Office space constructed along Huntington Avenue should be phasable, preferably in two equal-sized buildings.
- Alternatively, housing should be located on the triangle along with offices.
- Lobbies of office or residential structures should be separated from pedestrian ways through the site.

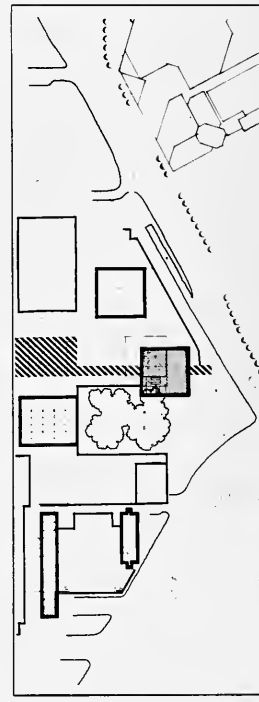
Financial analyses of the development project lead to the conclusion that the triangle must accommodate at least 800,000 gross sq.ft. of space, an amount that is impossible to create within the 155 foot IPOD limit. The principal issue affecting the amount of space which needs to be built is the revenues needed to pay for the large area of indoor common spaces on the site, which will total almost 4 acres. At least one taller structure is required. Thus, a critical issue is the location of the tower, particularly with respect to four influences — the north-south pedestrian way, the south open space, 101 Huntington and the Huntington Avenue street wall. Figure 18 indicates the three basic options.



I: Tower East of Main Pedestrian Way



II: Tower West of Main Pedestrian Way



III: Tower Over Main Pedestrian Way

Figure 18: Tower Location Options

None of the options would allow all of the key objectives to be attained. Locating the tower east of the main pedestrian way (Option I) would be best from the standpoint of minimizing shadows on the south open space and allowing the pedestrian way to pass by the tower uninterrupted. However, it would force the tower to be a narrow slab, located close to the street and to 101 Huntington, and it would require modest penetration of the three level deck. Option II, a tower located west of the main pedestrian way would also avoid disruption of pedestrian flows and would provide the best relationship between tall towers on the site. However, it would confine the south open space to shade during much of the day, including the critical noontime hours, and it would create an awkward relationship with the Christian Science Plaza. Option III, with a tower located midway between the two previous options, would assure reasonable sunlight in the south open space, and reasonable distances from the street and 101 Huntington. However, the core of the structure would force the main north-south pedestrian way to offset in one direction or another.

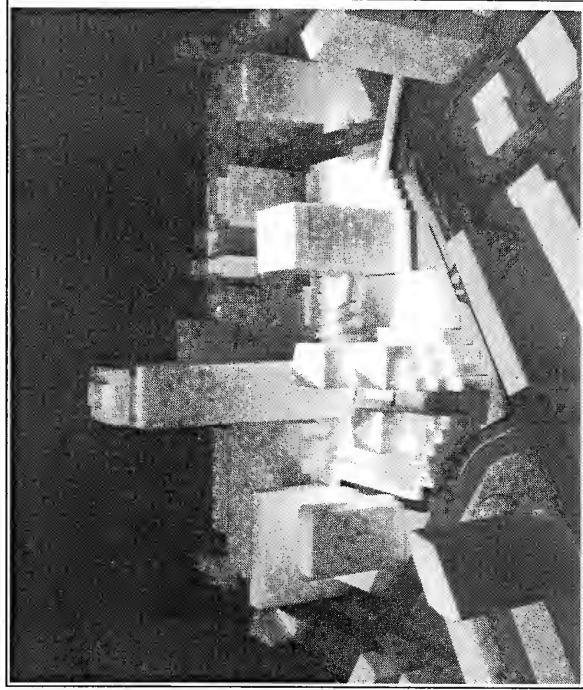
Over 20 variations of these three options were studied through drawings and models. Six examples are shown in model form in Figures 19 through 24.

After weighing the pros and cons of the many alternatives, two basic directions based on Options I and III were developed into the two basic families of alternatives included in this impact report. The decisive issue which led to the rejection of Option II was the serious effect which it would have on open space on the south side of the site.

Figure 19: Configuration Study



Figure 20: Configuration Study



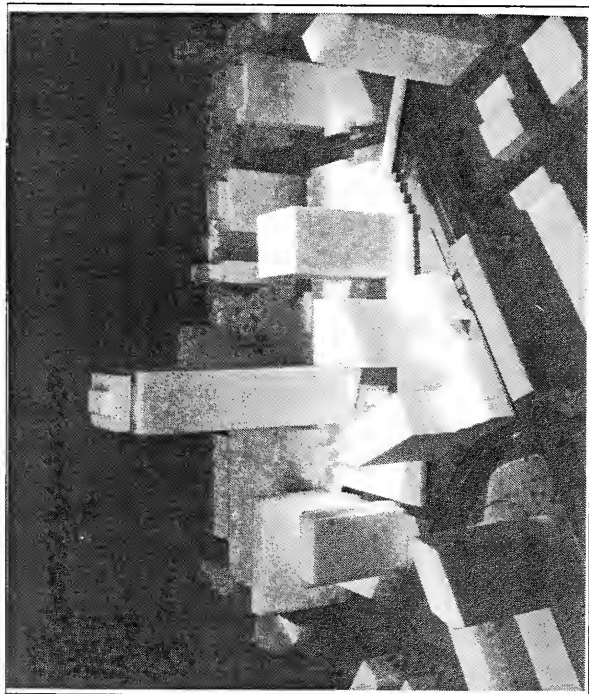


Figure 21: Configuration Study

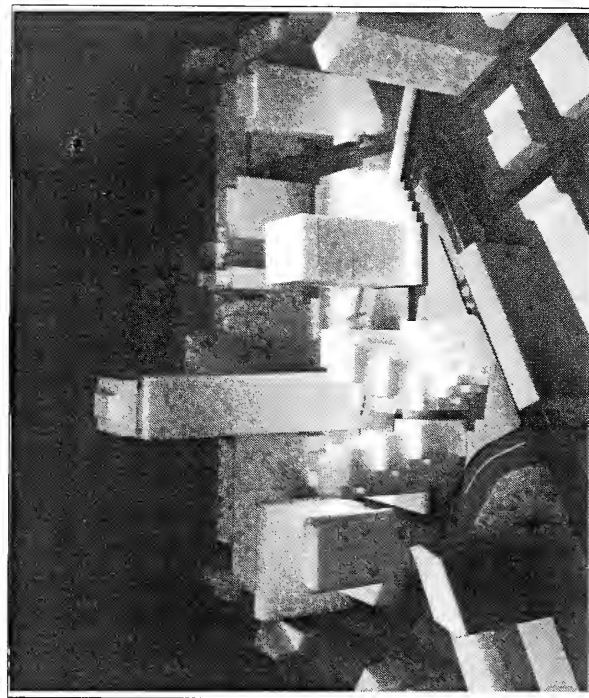


Figure 22: Configuration Study

Figure 23: Configuration Study

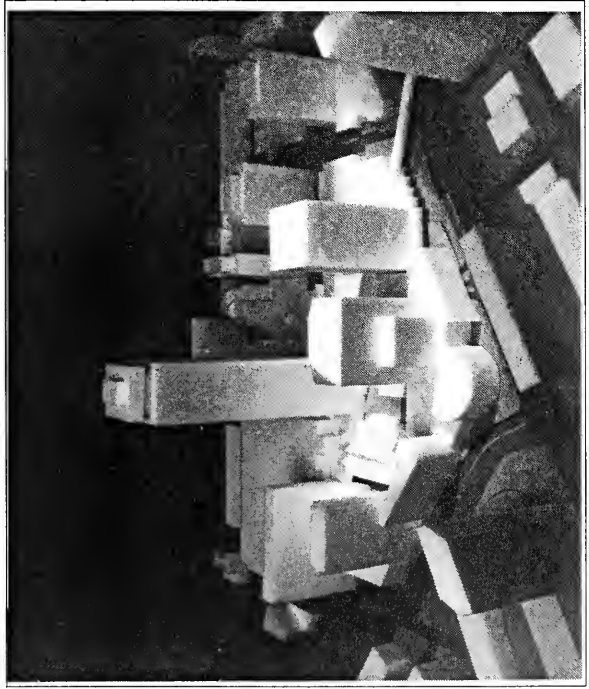
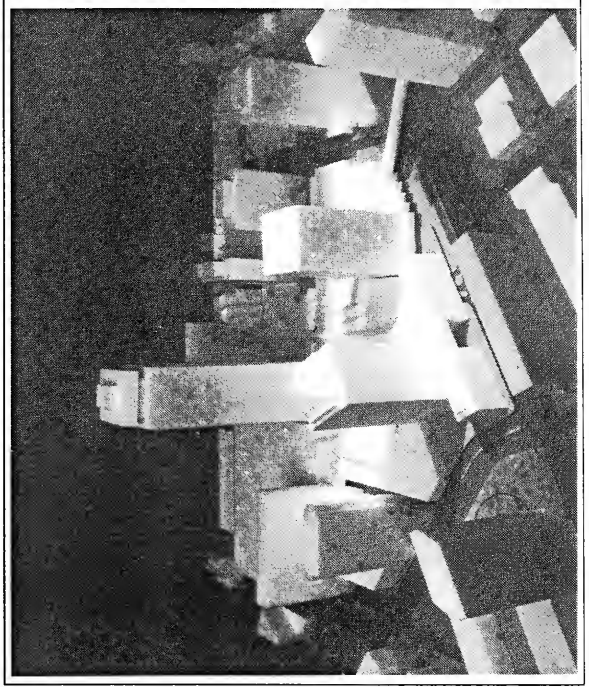


Figure 24: Configuration Study



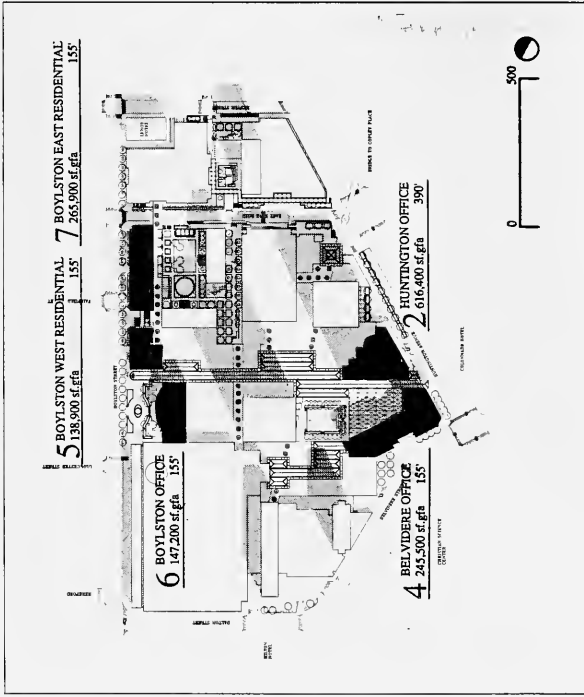


Figure 25: Alternative A Program and Heights

The issue of whether housing ought to be located on the Huntington-Belvidere triangle was also studied in depth. Since tall office towers fit most appropriately on the eastern side of the triangle, the most favorable location for housing is along Belvidere Street, overlooking the Christian Science Plaza. Locating housing on the triangle would allow fewer housing units to be located along Boylston Street, freeing part of the Boylston frontage for offices. However, an even exchange of offices for housing is not possible, since offices require deeper floor spaces and larger floor-to-floor heights. Figures 25 and 26 indicate the effects on heights and areas on the two sides of the site, resulting from moving offices to Boylston Street and housing to Belvidere, assuming equal program areas.

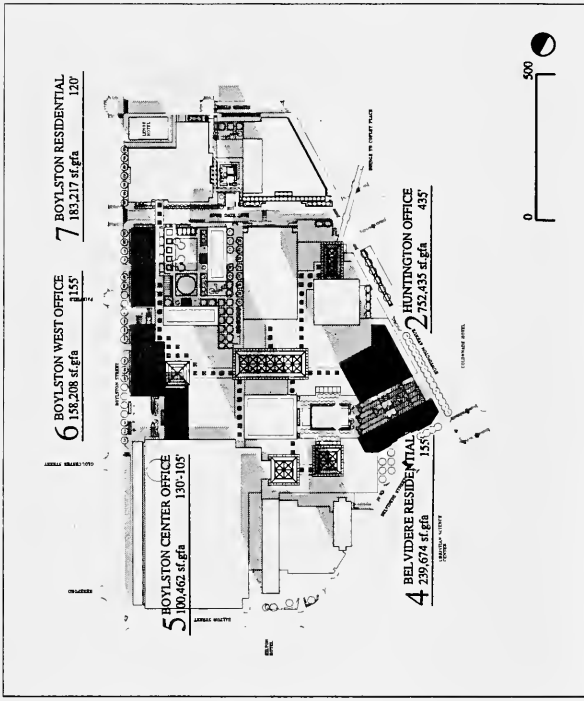


Figure 26: Alternative A2 Program and Heights

Alternative A (Figure 25) exemplifies an arrangement with all housing located on Boylston Street and the bulk of the office space located in two structures along Huntington and Belvidere. In this case, housing along Boylston would need to be 155 feet, with the two office structures on the south side of the site rising to 155 feet and 390 feet. Moving housing to the south side of the site, along Belvidere, would allow the heights of remaining housing on Boylston Street to be lowered to 120 feet, with offices at the street line of similar height. However, to compensate for the displacement of the Belvidere office structure (to locate housing there), the height of the remaining office structure on Huntington would need to be increased to 435 feet, and its floors would need to be increased in size. Thus, almost three quarters of the new office space on the site would need to be located in a single structure.

3.2 Pedestrian Level

The Prudential Center PNF proposal included an arcade along Huntington Avenue, and the scope of studies required for this submission included the exploration of an alternative. Figures 27 and 28 compare the cross section of Huntington Avenue with and without an arcade. The plan of the arcade may be seen on Figure 38 which follows.

The principal advantage of an arcade is that it would allow expansion of the street space available to pedestrians. Although the flow of pedestrians along Huntington is expected to be slightly less than along Boylston, there are expected to be significant accumulations of pedestrians near the entrance to the Prudential subway station and at

the Belvidere corner where pedestrians may be waiting for busses. Since the arcade is on the north side of the street, it would receive good sunlight while sheltering pedestrians from the weather. The only disadvantage to an arcade is the loss of depth for retail uses at street level, which is not significant between the Huntington-Belvidere intersection and the entrance to the north-south pedestrian way.

After study, a mixed strategy was considered to be the best solution. Between Belvidere and the entrance to the north-south pedestrian way, an arcade appears to be a good solution. West of the entrance, the additional retail depth is more necessary and under Alternative A, the arcade is deleted.

Figure 27: Huntington Avenue Without Arcade

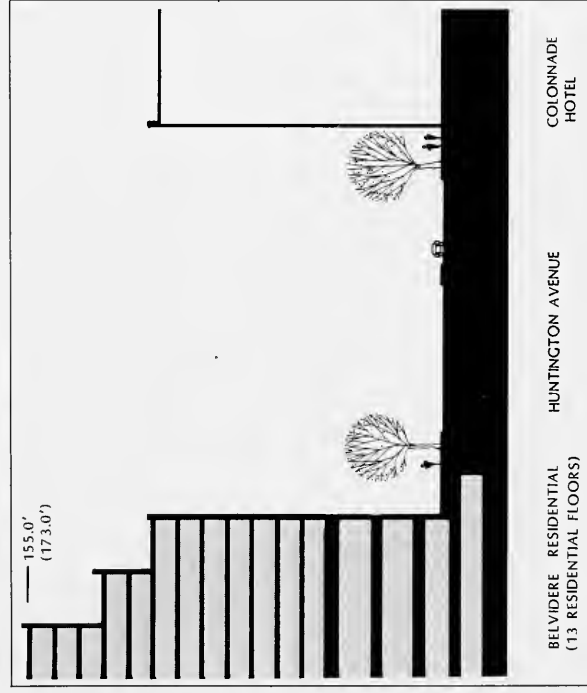
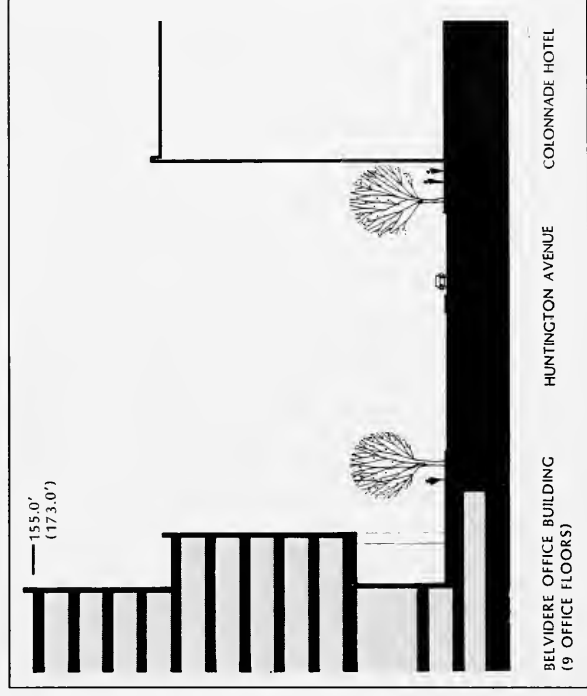


Figure 28: Huntington Avenue With Arcade



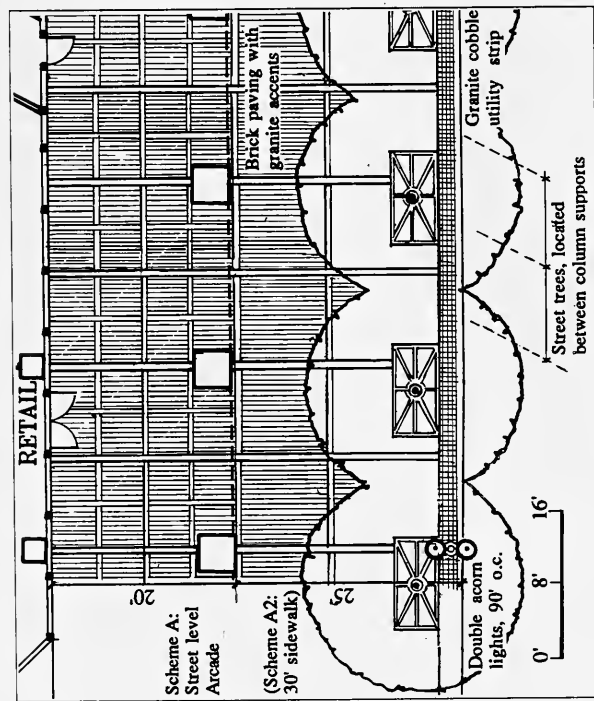


Figure 29: Huntington Avenue Streetscape

3.3 Streetscape

The prototypical streetscape along Huntington Avenue follows closely the pattern proposed for Boylston Street, to provide for continuity across the site. Figure 29 indicates the pattern of streetscape in the section between Belvidere and the entrance to the north-south pedestrian way, where the street would have both a generous sidewalk (25 feet) and an arcade (20 feet). As along Boylston, the principal materials would be brick paving with granite accents, a granite cobble strip, granite curbs and double acorn lights located 90 feet on centers. Where structural conditions permit, trees would be located along the curb, typically 30 feet on centers.

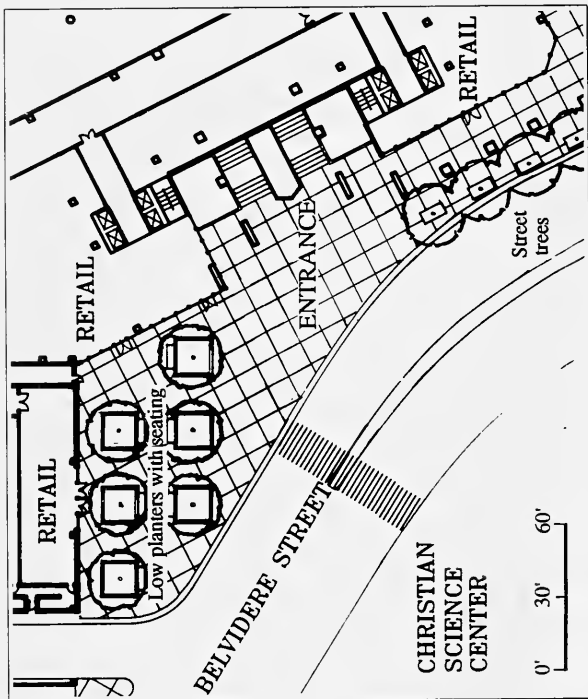


Figure 30: Belvidere Plaza

The typical sidewalk would be significantly enlarged along Belvidere Street, with a plaza created opposite the end of the Christian Science Plaza. Centered on the axis of the Christian Science Plaza would be a new entrance to the Prudential Center, with stairs rising to the intermediate level wintergarden. At street level, a bosque of trees would provide shade and protection at the north side of the Belvidere Plaza, and retail uses would rim as much of the plaza frontage as possible.

4. PEDESTRIAN PASSAGEWAY STUDIES

4.1 Alternative Concepts

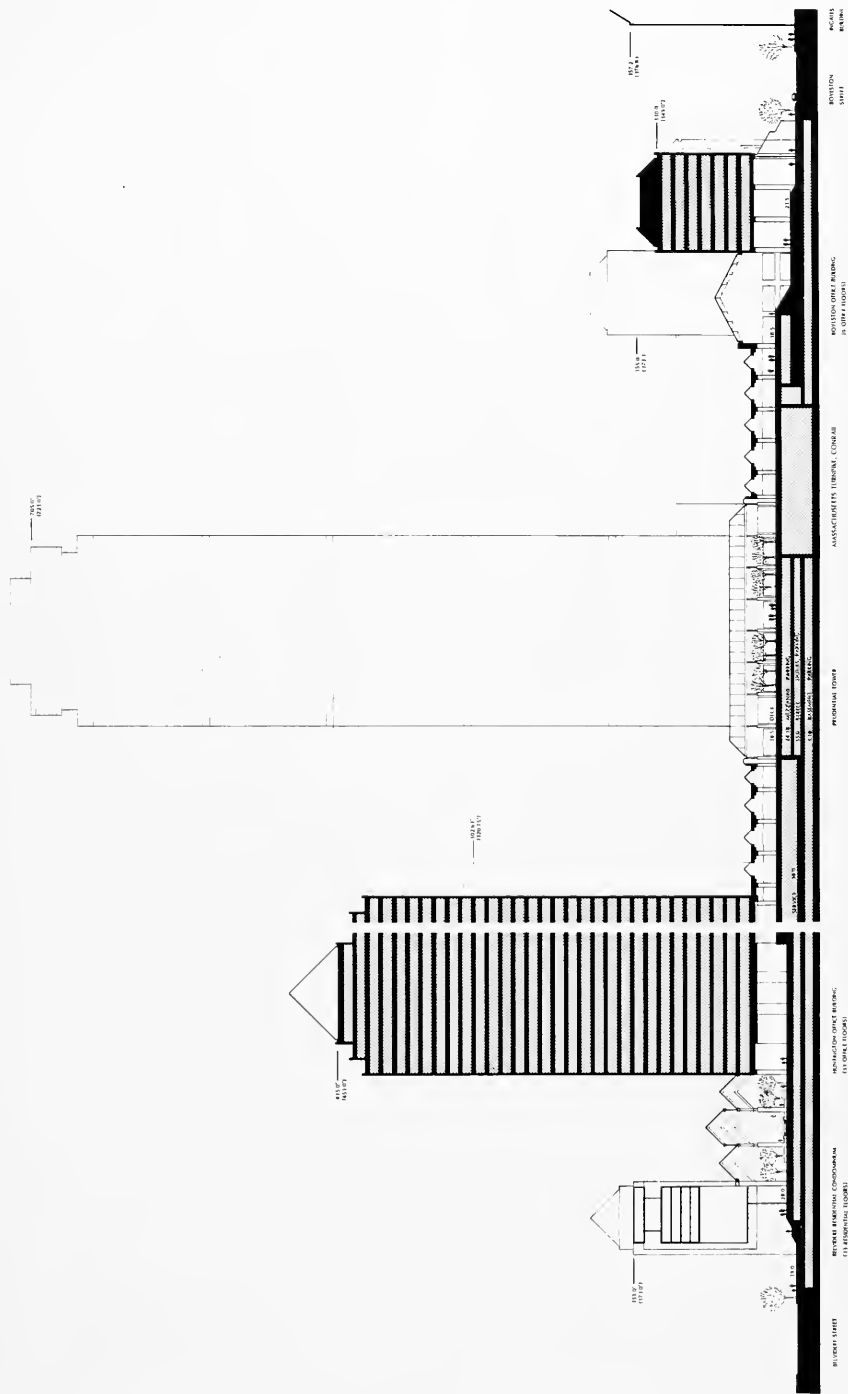
After studying numerous approaches to the design of pedestrian ways through the site two basic concepts emerged, and these were incorporated into the two families of alternatives. One approach, which is the pattern proposed for Alternative A, would imagine the site as having a series of retail frontages that are like block faces, and would cover the space between them with a transparent roof that is as unobtrusive as possible. They would appear as streets with roofs added, much as many cities have done in cold weather climates. At main intersections, the area of glazed cover would be widened to form pedestrian squares. In its purest form, as shown on Figure 31, the entire pedestrian way would be glazed, with tall buildings surrounding the street visible through the glass cover. However, the east-west covered way, which passes partially under buildings, would necessitate a more complex covering system.

A second approach to the system of pedestrian routes differentiates more strongly between public squares and passageways. As exemplified by Alternative A2, a series of five public squares would be created, four at entrances to the enclosed north-south and east-west passageways and a fifth at the intersection between them. Between the squares, connections would have skylights where they are free of buildings, and would be organized as a series of interesting links, each with their own character. Figure 32 shows the interplay of places and passages along the length of the north south route across the site.

These two approaches are evident on Figures 25 and 26 above. Their three-dimensional character is illustrated and contrasted in Figures 57 and 58 in Volume I: Summary.

Figure 32: Section Through Site - Alternative A2

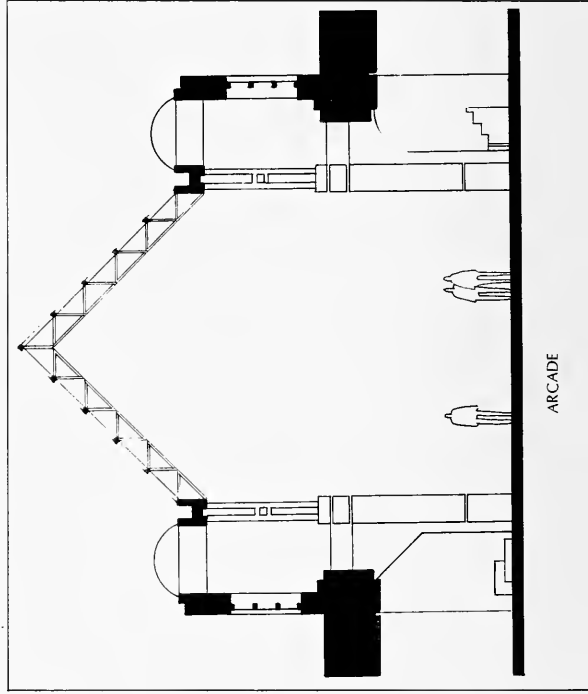
Note: Building heights are given first by their apparent height above the street. The number in brackets states the building height relative to the Boston City Base (BCB).



4.2 Sections and Materials

Figure 33 indicates the section through the passageway system of Alternative A, indicating the scale of spaces proposed and the relationships of pedestrian areas to shops. The basic 30 by 30 foot module of the parking structure below sets the dimensions of main pedestrian way. On each side a 10 foot zone would be reserved for shop fronts and display cases, projecting from the apparent wall of buildings fronting on the street. A second story clerestory would give "buildings" along the street a two story appearance. While the main level would need to be of fireproof construction, above it columns and the roof structure could be smaller in scale and less obtrusive. The roof system would be constructed from metal components. Yet to be explored is the possibility of a clerestory that could be opened during summer months, but closed during winter, to allow natural ventilation during good weather.

Figure 33: Section Through Glazed Arcade



4.3 Wintergarden

The combination of a glass covering system for main public places with a skylit passageway system is shown on Figure 34, with an enlarged passageway section shown on Figure 35. This scheme is proposed on Alternative A2, where pedestrian ways have a less linear character. The typical section would follow the 30 by 30 foot structural bay, with zones of 5 feet set aside beyond the 30 foot pedestrian passageway for displays and entrances. Where the passageway was clear of buildings, a large skylight would provide natural light to each bay. The passageways connecting the public spaces, under this scheme, would be more clearly indoor spaces, gaining their interest from the materials, form and details of the shops and enclosure.

Figure 34: Section Through Arcade-Passageway

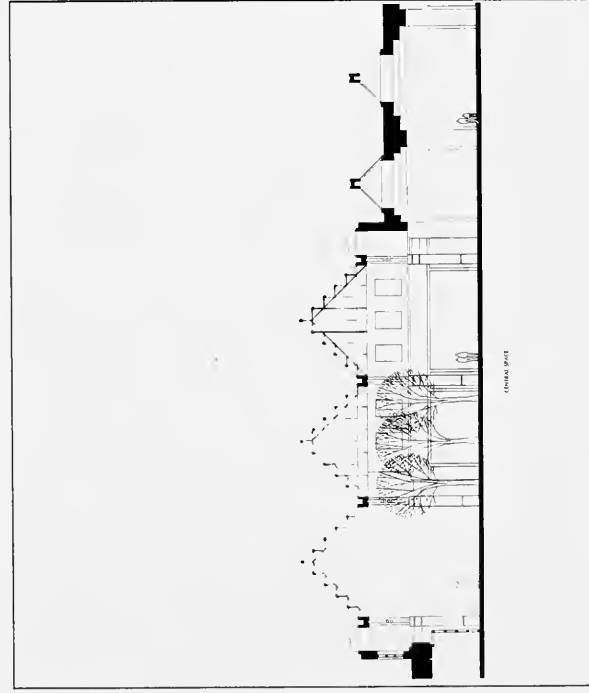
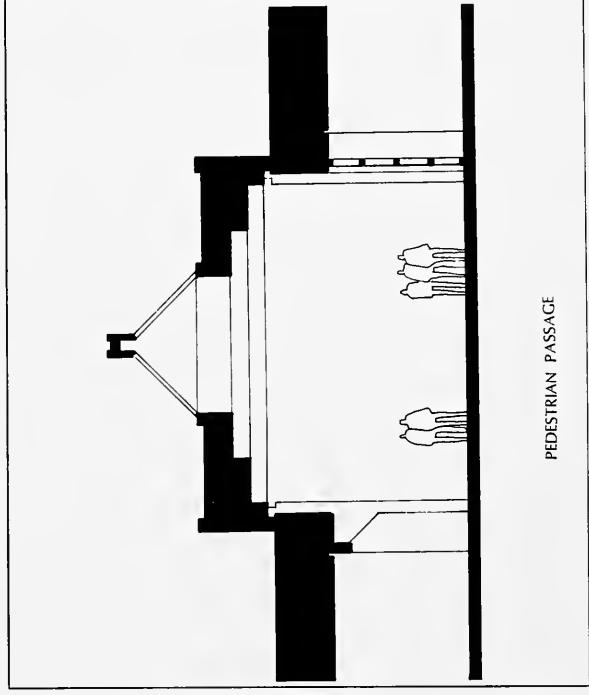


Figure 35: Section Through Passageway



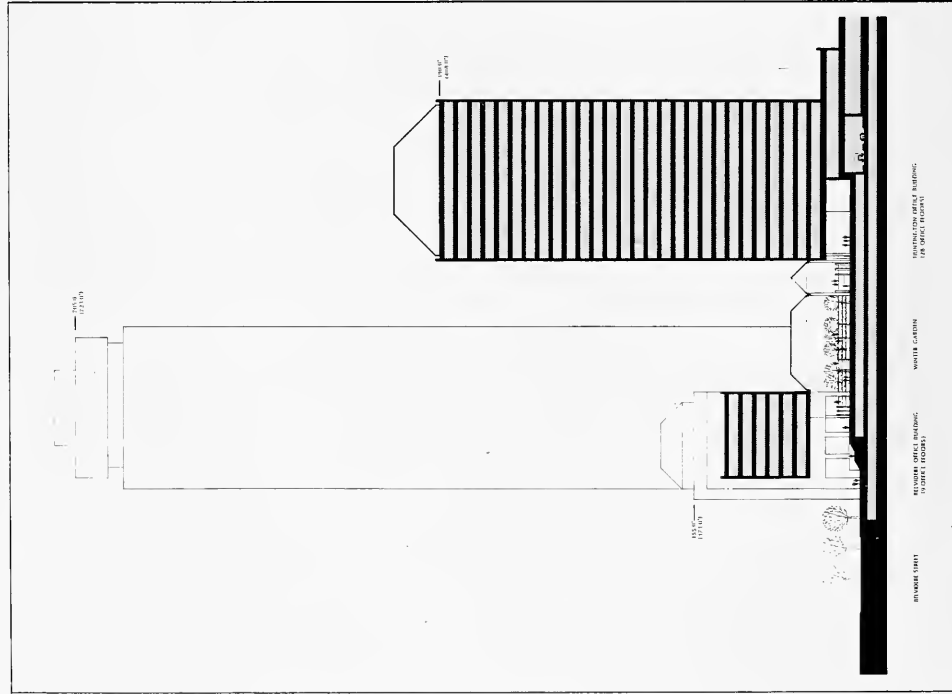


Figure 36: Section Through Wintergarden - Alternative A

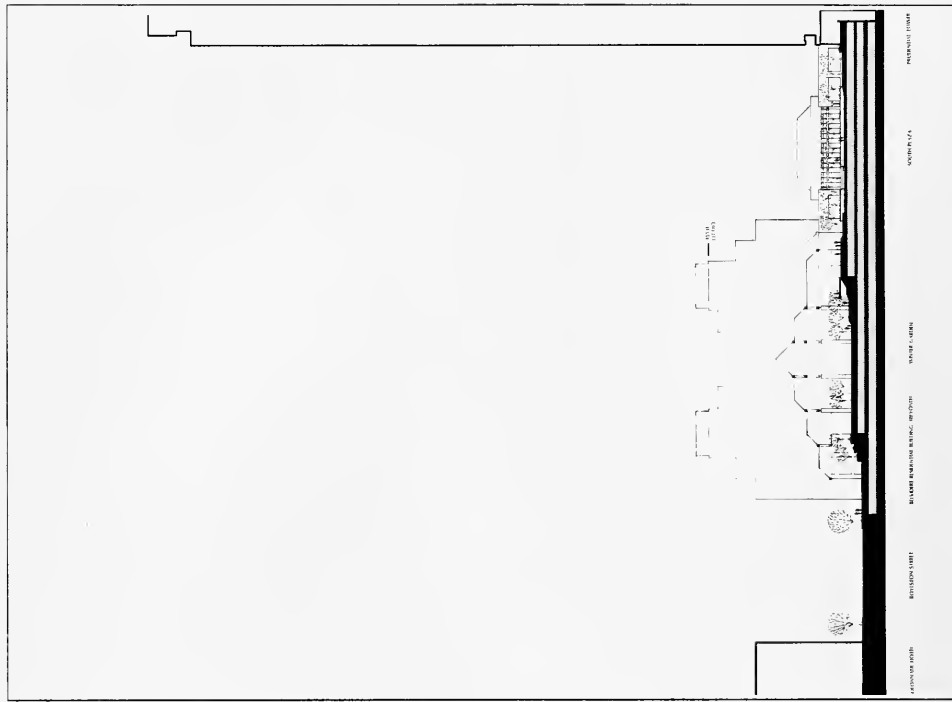


Figure 37: Section Through Wintergarden - Alternative A2

5. ACCESS STUDIES

5.1 Turnpike Ramp - South Entrance

The Huntington Avenue entrance to the site currently serves as the principal entrance to the South Garage as well as the location of entry and exit of service vehicles destined for the loading docks of the south retail area, Saks Fifth Avenue and 101 Huntington. The entrance is located on the middle level of the three level garage, and autos destined for the upper or lower levels reach them via circular ramps at the end of the entrance drive. Most automobiles also exit the garage at the middle level via a driveway exiting to Belvidere street, although a peak hour exit is also provided from the upper level near Huntington and East Ring Road, and from the Lower Level onto Dalton Street. The current system depends upon South Ring Road to distribute traffic along Huntington

Avenue. The combination of driveways and traffic movements makes it difficult for pedestrians to walk along the north side of Huntington Avenue.

Both families of alternatives (A and A2) propose the elimination of South Ring Road, and the reorganization of garage entrances along Huntington Avenue. The proposed scheme, illustrated on Figure 38, would create a new upper level automobile entrance for westbound Huntington traffic just past East Ring Road, reorganizing that intersection to provide more generous pedestrian areas and clearer pedestrian crossings. Auto and truck traffic arriving via the Turnpike exit ramp would continue to enter the garage and loading area via the Huntington entrance on the middle level. Elimination of South Ring Road adjacent to the Turnpike ramp would eliminate the current weaving conflicts at the throat of the ramp and would allow both a generous pedestrian sidewalk and new retail uses to be constructed along the street.

Figure 38: Huntington Without South Ring Road

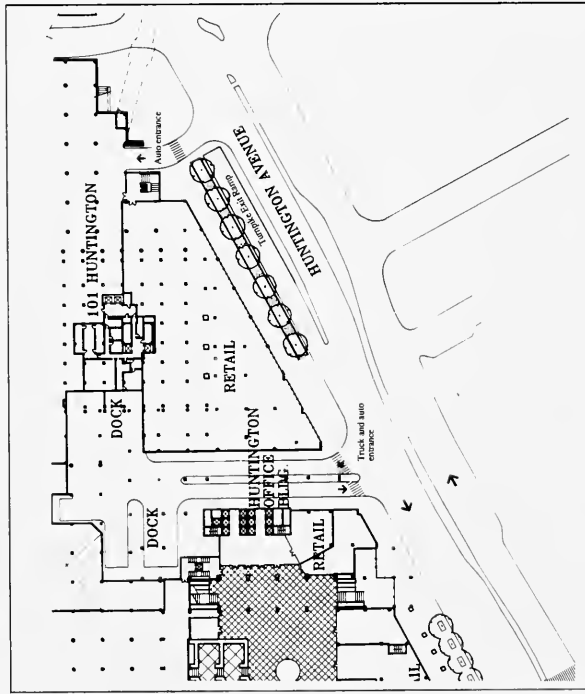
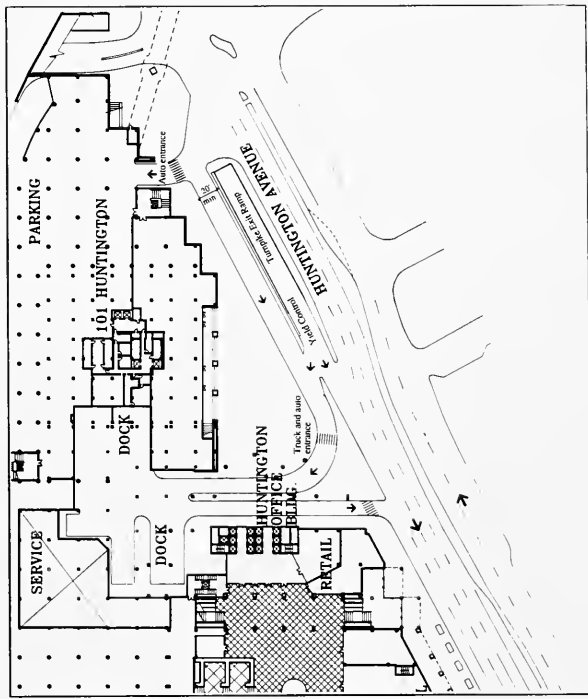


Figure 39: Huntington With South Ring Road



The single disadvantage of the arrangement would be the need for eastbound trucks destined for the Huntington loading area to weave across traffic exiting the Turnpike Ramp and headed west. However, the number of trucks making this movement would be small (estimated as xx per day), and they would be easily visible to drivers exiting the ramp. Moreover, the total potential weaving conflicts today number xx, and the future condition would be a significant improvement.

An alternative to the proposed arrangement, shown on Figure 39, would be to retain one section of South Ring Road adjacent to the Turnpike exit ramp for trucks only to enter the loading area without crossing the throat of the ramp. Automobiles would enter as on the previous scheme. The result would be a narrower pedestrian sidewalk with more traffic lanes to cross and less of an opportunity to add new retail uses to the Huntington frontage. Moreover, there would potentially be a conflict between automobiles and trucks merging at the entrance to the complex. Trucks would be less visible to motorists than on the previous scheme, since they would need to look over their right shoulder to see them, rather than seeing them directly ahead.

5.2 Alternative Loading Access

Several possible ways of reorganizing access to the Huntington loading dock were explored as another way of eliminating potential conflicts between motorists and trucks along Huntington Avenue. A direct east-west connection from the large loading dock adjacent to the Prudential Tower to the Huntington Loading dock would be impossible, for several reasons: it would totally disrupt movement patterns in the parking garage, including the main exit route; it would require demolition of a slice through the upper level of the parking garage to achieve the double height necessary for trucks, also severing part of the parking on that level; and it would require reinforcing of floor slabs and foundations below the access way, at extremely high costs. Thus, such a scheme was not explored further.

A more modest alternative scheme, shown on Figure 40, however was explored. This arrangement, which would include a passageway from Belvidere to the loading dock through areas slated for new construction, would overcome some of the difficulties noted above. However, the traffic conflicts at the entrance along Belvidere, located close to the current Prudential Tower and Sheraton garage/loading area exit and entrance, also make this option a practical impossibility. The current level of service

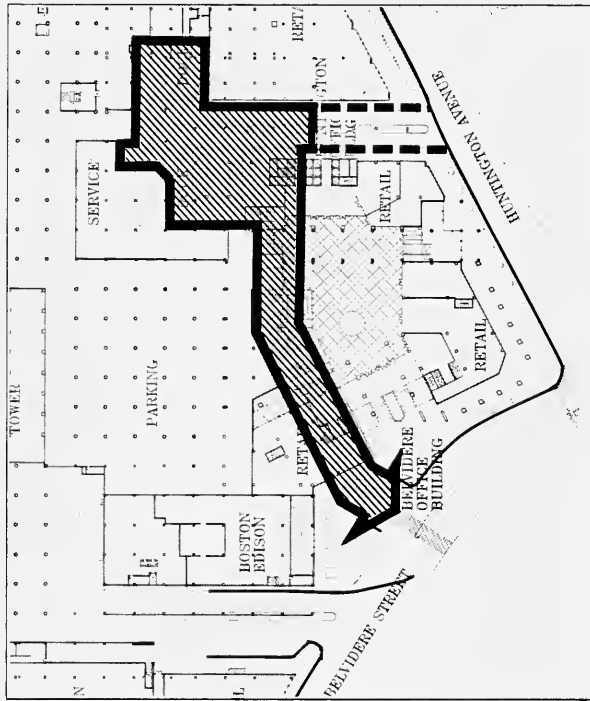
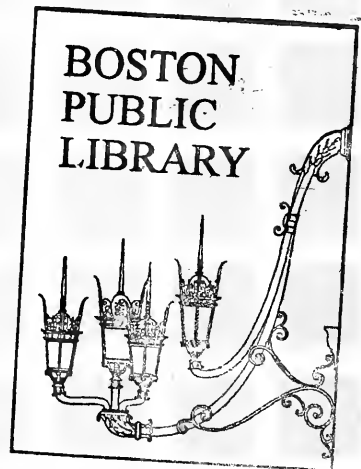
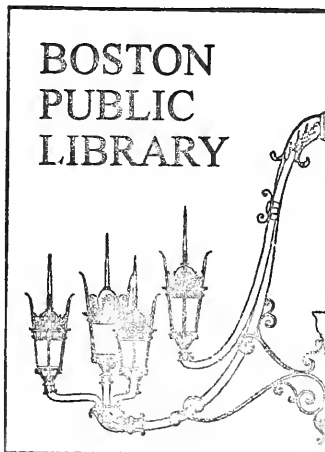


Figure 40: Alternative Access to Huntington Loading Area

of the Belvidere garage exit is nearly unacceptable, and the addition of another major entrance so near would create an intersection that was unmanageable. Moreover, forcing all traffic entering the South Garage through the Belvidere-Huntington intersection would greatly exacerbate congestion at that intersection and overload Belvidere Street. The simpler solution of entering and exiting directly onto Huntington appears to be more appropriate.

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DRAFT
Vol. 3





April 12, 1989

submitted to:
The Boston Redevelopment Authority
Massachusetts Executive Office of Environmental Affairs
Executive Office of Environmental Affairs Number: 7208

submitted by:
The Prudential Property Company, Inc.
for The Prudential Insurance Company of America

Vanasse Hangen Brustlin, Inc.

DRAFT PROJECT AND ENVIRONMENTAL IMPACT REPORT

PROJECT

Prudential Center Redevelopment
Boston, Massachusetts

DEVELOPER

The Prudential Property Company, Inc., for The Prudential Insurance Company of America

STATUS OF PROJECT

The developer submitted a Project Notification Form to the Boston Redevelopment Authority (BRA) and an Environmental Notification Form to the Massachusetts Executive Office of Environmental Affairs (EOEA) on June 29, 1988. Scoping letters were issued to the developer by the BRA and EOEA on September 1, 1988. The EOEA number is 7208. The project is in pre-schematic design stage. Master plan approval is being sought.

BRIEF DESCRIPTION OF THE PROJECT

The project includes the addition of new offices, retail spaces and housing to the current Prudential Center site. New housing and offices, with retail uses at their base, will be constructed principally along the Boylston Street, Huntington Avenue and Belvidere Street frontages. The current retail area will be reconstructed and expanded with indoor pedestrian passageways. Enclosed pedestrian routes will provide connections between Boylston Street and Huntington Avenue, and between Copley Place and the south entrance of the Hynes Convention Center. A system of public squares, a wintergarden and outdoor open spaces will be created as amenities for those using the center and adjacent neighbors. A neighborhood commercial area, including an expanded supermarket, is proposed for Huntington Avenue and East Ring Road. East Ring Road will be improved to facilitate pedestrian flows to the shopping area. The existing parking garages will remain approximately the same size, but their capacity will be expanded by approximately 800 spaces through changes to their management.

ALTERNATIVES CONSIDERED

Two basic planning approaches have been considered for the site, and for each three scales of building program have been analyzed. Alternative A proposes two new office structures along Huntington and principally housing, with a small office structure, along Boylston. Alternative A2 has housing as well as offices along Huntington Avenue and housing, along with expanded offices, along Boylston Street. The form of structures, their heights, and the organization of pedestrian routes also vary between these two basic alternatives. Alternatives B and B2 are similar in configuration, respectively, to Alternatives A and A2, but the overall development totals 10 percent less area. Alternatives C and C2 follow the same outlines, but are 20 percent smaller in area than Alternatives A and A2. In the course of preparing these plans, a large number of other design and functional alternatives were considered and rejected as less desirable.

DRAFT PROJECT AND ENVIRONMENTAL IMPACT REPORT

DEVELOPMENT PROGRAM

The three basic levels of program studied are, as follows:

(000 FAR gross sq. ft.)

Use	Alternatives A and A2	Alternatives B and B2	Alternatives C and C2
Offices	1,009	865	811
Residential	404	378	324
Retail	268*	210*	160*
Total Areas	1,681	1,448	1,295
Plus Indoor Pedestrian Areas	153**	153**	103**
TOTAL PROGRAM	1,834	1,601	1,398

* In addition, 143,000 gross sq. ft. of existing retail is demolished and rebuilt.

** Areas vary slightly between alternatives.

DEVELOPMENT SCHEDULE

The project is planned as a number of separate phases to be completed over a 10 year period. Construction will begin on the south side of the site, moving to the north. Phases along Huntington Avenue should be completed by 1994, with the Boylston Street area completed by 1999.

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- I: Summary
- IA: Summary Appendix
- II: Urban Design Alternatives
- III: Transportation Access Plan
- IIIA: Transportation Access Plan Appendix
- IV: Environmental Impacts
- V: Wind Impacts
- VA: Wind Impacts Appendix
- VI: Infrastructure Systems
- VII: Housing Impacts
- VIII: Public Benefits
- D: Drawing Set

PRUDENTIAL CENTER REDEVELOPMENT

DRAFT PROJECT AND ENVIRONMENTAL IMPACT REPORT
VOLUME III: TRANSPORTATION ACCESS PLAN

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1. INTRODUCTION

The Prudential Property Company, Inc. has embarked on a process of planning and implementing a phased redevelopment of the 27-acre Prudential Center site located between Boylston Street and Huntington Avenue. This transportation analysis examines the following:

- o The use of existing roadways, public transportation, parking facilities, and pedestrian paths serving the site and study area
- o Existing state and city plans for upgrading these facilities
- o Impacts of the proposed Prudential Center Redevelopment on the transportation system in 1994 (initial phase of development) and 1999 (project completion)
- o Measures to mitigate adverse impacts

Data and analyses used to support this report are presented in the Transportation Appendix.

Analyses were performed for existing and future conditions to project the impact of redevelopment in terms of vehicle, transit, and pedestrian trips to and from the project site. Analyses of parking supply and demand for future forecast years and conditions were conducted for the project. In all the cases, other projects that are expected to be completed by the analysis years have been included in the assessment of future conditions. The work described herein is based on the Boston Redevelopment Authority (BRA) scope dated September 8, 1988 and on the Massachusetts Environmental Policy Act (MEPA) Unit scope dated September 1, 1988.

1.1 The Prudential Center Redevelopment Proposal

The redevelopment plan continues and expands the mixed-use character of the Prudential Center. Sites have been identified for three new housing structures and three new office buildings. In addition, retail areas (except the existing anchor stores) will be redeveloped and expanded including a new commercial area on East Ring Road.

This volume presents transportation analyses for three alternative building programs. Each program is analyzed in two phases: 1994 Partial-Build and 1999 Full-Build. Table III-1 presents the proposed land uses for each alternative by phase. These programs were used to project the transportation impacts of the proposed redevelopment alternatives.

Alternative A would add approximately 1,000,000 square feet of office space, 270,000 square feet of retail space, and 300 residential units to the existing center. Alternative B would be approximately 10 percent smaller than Alternative A and would include approximately 850,000 square feet of office space, 200,000 square feet of retail space, and 280 residential units. Alternative C would be approximately 10 percent smaller than Alternative B and would add approximately 800,000 square feet of office space, 160,000 square feet of retail space, and 240 residential units.

Development Alternatives A2, B2, and C2 are the same size as Alternatives A, B, and C, respectively, but involve changes in the location of various uses. Office space would be shifted from Belvidere Street in the primary alternatives to Boylston Street in the secondary alternatives. Conversely, residential space would be shifted from Boylston Street in the primary alternatives to Belvidere Street in the secondary alternatives. Additionally, there would be some shifts in construction phases between the corresponding alternative scenarios as seen in Table III-1.

TABLE III-1
ALTERNATIVE DEVELOPMENT PROGRAMS
(NET ADDITIONAL DEVELOPMENT)

<u>Alternatives</u>	<u>Office</u> <u>(Square Feet**)</u>	<u>Retail*</u> <u>(Square Feet**)</u>	<u>Residential</u> <u>(Units)</u>
<u>Alternative A</u>			
1994	861,900	145,900	0
1999	<u>147,200</u>	<u>121,900</u>	<u>300</u>
Total	1,009,100	267,800	300
<u>Alternative A2</u>			
1994	752,400	146,500	150
1999	<u>258,700</u>	<u>122,400</u>	<u>150</u>
Total	1,011,100	268,900	300
<u>Alternative B</u>			
1994	717,500	126,900	0
1999	<u>147,600</u>	<u>78,500</u>	<u>281</u>
Total	865,100	205,400	281
<u>Alternative B2</u>			
1994	601,200	122,300	102
1999	<u>263,900</u>	<u>103,500</u>	<u>130</u>
Total	865,100	225,800	232
<u>Alternative C</u>			
1994	663,400	92,200	0
1999	<u>147,600</u>	<u>67,700</u>	<u>240</u>
Total	811,100	159,900	240
<u>Alternative C2</u>			
1994	606,400	32,700	88
1999	<u>204,600</u>	<u>86,700</u>	<u>112</u>
Total	811,100	162,400	200

* Retail square footage does not include approximately 142,900 square feet of existing retail space to be demolished and rebuilt.

** FAR gross square feet based on city of Boston Zoning Code.

1.2 Study Area

The transportation study for the Prudential Center covers a relatively large area of the Back Bay and South End. The area is generally bounded by Beacon Street on the north; Massachusetts Avenue on the west; Huntington Avenue, Columbus Avenue, and Stuart Street to the south; and Berkeley Street on the east. Within the transportation study area, the BRA and MEPA have designated 24 intersections as analyses locations to measure the traffic impacts of the project during weekday peak hours. Eight of the intersections were also identified for analysis of peak Saturday conditions. The study intersections and the site location are illustrated in Figure III-1.

The BRA and MEPA scopes also require analysis of public transportation serving the Prudential Center. Public transportation in the area is well developed and used extensively. Located within one-quarter mile of the site are two of the four subway lines operated by the Massachusetts Bay Transportation Authority (MBTA), the commuter and Amtrak rail lines at Back Bay Station, and express buses at Copley Square.

In addition to the transportation study being performed for the Prudential Center, a major transportation study for the Back Bay is being conducted for the city of Boston. The Back Bay Transportation Study includes a comprehensive analysis of transportation issues relating to the entire Back Bay area. It began in the fall of 1988 and is being conducted by Cambridge Systematics Inc. for the Boston Transportation Department. The study includes analysis of intersections that were analyzed for the Prudential Center Redevelopment. The deadline for completion of the Back Bay Transportation Study has not yet been confirmed and no information is publicly available.

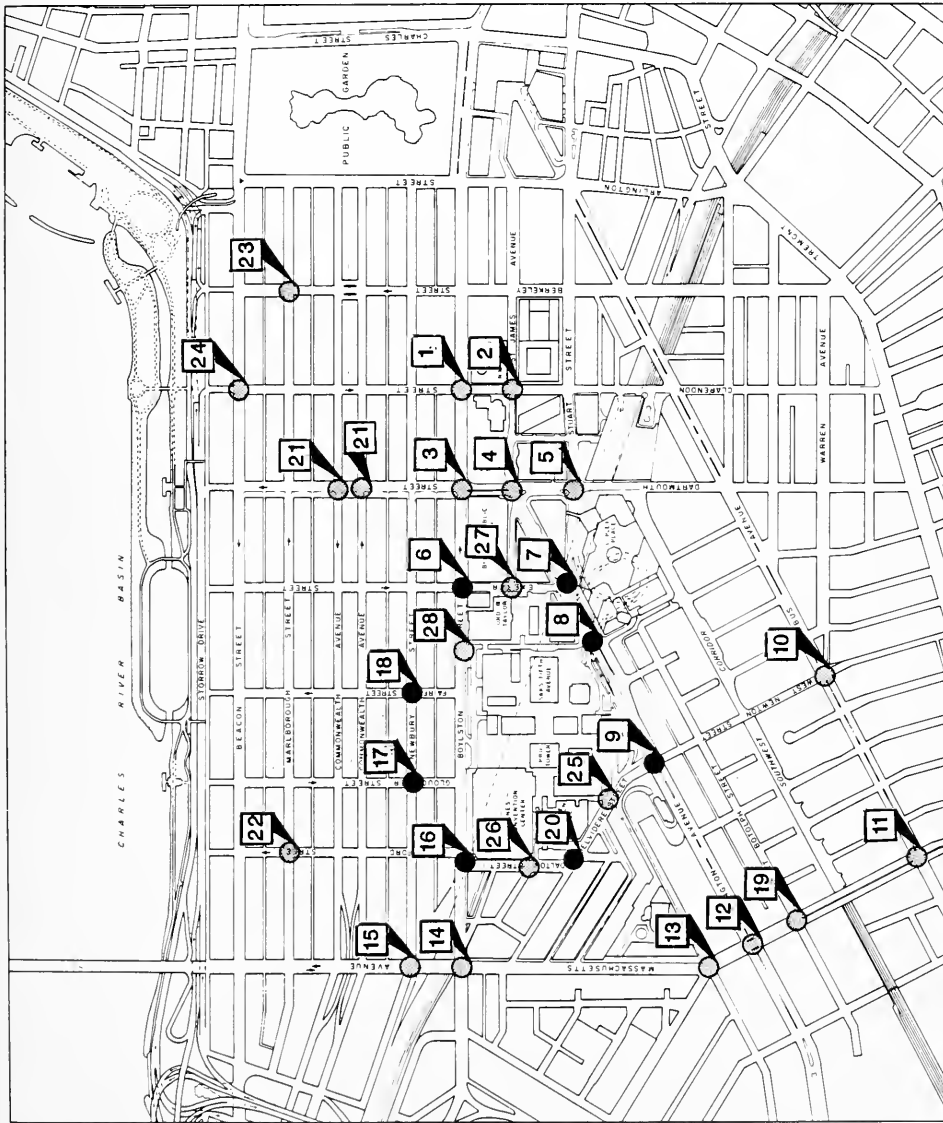
**Fig. III-1
Study Area
Traffic Analysis
Locations**

LEGEND:

1 Location Number

○ Weekday
AM and PM

● Weekday
AM and PM and
Saturday Midday



1.3 Study Methodology

The transportation study was conducted in three distinct phases, each building upon the previous phase. Phase I involved an inventory of existing conditions and travel demand characteristics in the area. The first step included researching previous transportation studies, and assembling and organizing previously collected data. The second step involved supplementing existing data with new observations of area travel characteristics.

As part of the new data collection effort, roadway volumes were mechanically recorded for 24-hour periods on all roadways around the site. Observations of traffic turning movements at selected study area locations were conducted during morning and evening peak periods (7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM, respectively) to update existing intersection volume data. Based on weekend 24-hour mechanical counts, Saturday midday turning movement counts were recorded between 1:30 PM and 3:30 PM at the eight locations specified in the BRA and MEPA scopes.

Parking accumulation data were obtained from reports generated by the Prudential Center Garage computer system. Computer summaries of exiting and entering vehicles were supplemented by selected garage counts, truck counts in loading areas, and turning counts at all site access locations.

Finally, Vanasse Hangen Brustlin, Inc. collected data on transit line performance and ridership on the Green and Orange Lines and obtained schedule information for the other transit lines, commuter rail, and bus service from the Massachusetts Bay Transportation Authority (MBTA). Data collected during the inventory phase were assembled and used to define the existing transportation network as a base condition for subsequent analyses.

Phase II of the study built upon the data base compiled in Phase I and established the framework for evaluating the transportation impacts of the proposed project. In this phase, specific travel demands for the project were assessed along with future demands projected to be created by other area developments. Projections of demands were made for all travel modes

--automobile, transit, and pedestrian--and for parking. The analysis was performed for Partial- and Full-Build of the Prudential Center Redevelopment and included the following scenarios:

- o 1988 - Existing Conditions
- o 1994 - No-Build for Prudential Center Redevelopment, but with area background development included
- o 1994 - Build of initial phase of Prudential Center Redevelopment
- o 1999 - No-Build for Prudential Project, but with area background development included
- o 1999 - Full-Build for Prudential Project

Phase III, the final study phase, evaluates the impacts of the project on the transportation system and identifies measures to mitigate impacts. Mitigation efforts include measures to enhance the effectiveness of various components of the transportation system and to reduce vehicular travel demand by encouraging shifts from single-occupant vehicles to ridesharing and transit use. Also included within this phase was the establishment of goals for vehicular travel demand reduction, and identification of a program to monitor future project travel demands and to measure the effectiveness of various mitigation measures.

2. EXISTING CONDITIONS

2.1 Traffic

The existing roadways providing access to and through the study area consist of local and arterial streets, and a limited access highway. The following inventory of roadway characteristics, traffic volumes, operating conditions, and level-of-service was compiled as part of the Phase I data collection process.

2.1.1 Roadway Network

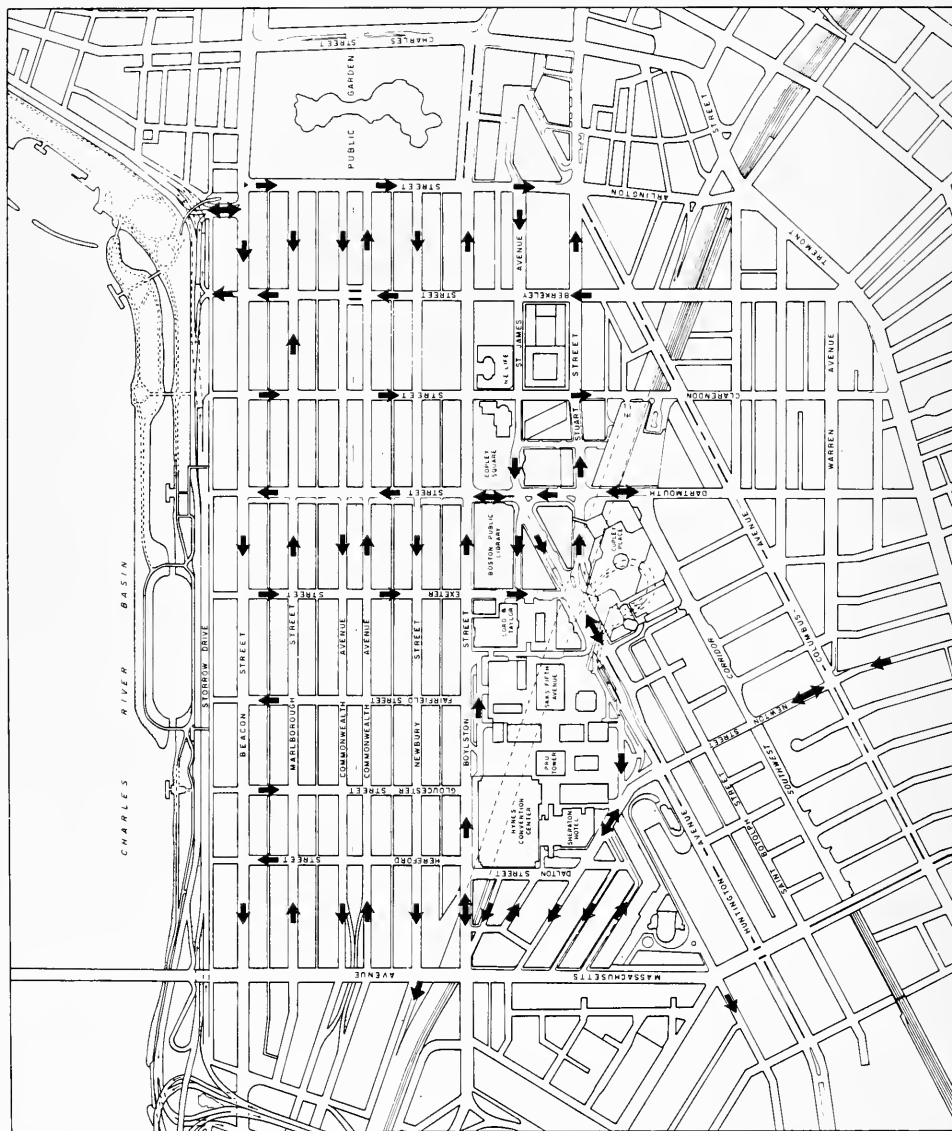
Figure III-2 illustrates the existing roadway circulation pattern within the study area and Table III-2 shows characteristics of study area roadways. A more detailed description of study area roadways is provided in the Appendix.

Regional roadways providing access to the study area include:

- o The Massachusetts Turnpike (I-90) from the west
- o Storrow Drive (Route 1) from the west and east with connections to I-93
- o Massachusetts Avenue from the south and the Southeast Expressway
- o Massachusetts Avenue from the north and Cambridge across the Harvard Bridge
- o Huntington Avenue
- o Columbus Avenue (Route 28)

Prudential Center Redevelopment

Fig. III-2
Traffic
Circulation



0 200 400
Scale feet



EXISTING ROADWAY CHARACTERISTICS

<u>Roadway</u>	<u>Classification</u>	<u>Direction of Travel</u>	<u>Total Number of Travel Lanes</u>	<u>Parking</u>
Massachusetts Turnpike (Route I-90)	Divided, limited access highway.	East and West	6-8	None
Sorrow Drive (Route 1)	Divided, limited access highway.	East and West	4-6	None
Massachusetts Avenue	Two-way arterial road.	North and South	4	Metered parking in each direction
Huntington Avenue	Major, divided arterial.	East and West	4-6	Metered parking in each direction
Columbus Avenue (Route 28)	Connector road.	East and West	2	Parking in each direction
Boylston Street	Major one-way connector street. Two-way west of Dalton Street.	East	3	Metered parking on both curb lanes
Dartmouth Street	One-way between Boylston Street and Beacon Street. Two-way between Boylston and St. James Street.	North and South	2	Metered parking in each direction
Exeter Street	One-way connector street.	South	2	Metered parking on both curb lanes
St. James Street/ Stuart Street	Two connector streets. function as a one-way pair between Dartmouth Street and Arlington Street. St. James Street ends east of Arlington Street, while Stuart Street provides two-way travel.	West: St. James Street East: Stuart Street	2	None
Berkeley Street	Major one-way connector street.	North	2	Metered parking on both curb lanes
Clarendon Street	One-way connector street.	South	2	Metered parking on both curb lanes
Marlborough Street	One-way connector street.	East	3	Residential parking on both curb lanes
Beacon Street	One-way connector street.	West	3	Resident and metered parking on both curb lanes

TABLE III-2 (Continued)
EXISTING ROADWAY CHARACTERISTICS

<u>Roadway</u>	<u>Classification</u>	<u>Direction of Travel</u>	<u>Total Number of Travel Lanes</u>	<u>Parking</u>
Newbury Street	One-way connector street.	West	1 (can accommodate two moving lanes of vehicles)	Metered parking on both curb lanes
Commonwealth Avenue	Paired, one-way connector streets.	East and West	4	Resident and metered parking on the right side curb lane
West Newton Street	Two-way street.	North and South	2	Parking provided on the right curb lane
Dalton Street	Local, two-way connector street.	North and South	2	None
Belvidere Street	Local, two-way street from Huntington Avenue to Dalton Street. One-way from Dalton Street to Massachusetts Avenue.	North and South	2 (1 travel lane from Dalton Street to Massachusetts Avenue)	None, except from Dalton Street to Massachusetts Avenue where parking is provided on both curb lanes
North Ring Road	One-way local road.	East	1	Parking provided for Star Market
East Ring Road	Two-way local road.	North and South	2	None
South Ring Road	One-way local road.	West	1 (2 travel lanes from Massachusetts Turnpike exit to Belvidere)	Permit Parking

Other major roadways providing access within the study area or to the regional highway system from the Prudential Center include: Boylston, Dartmouth, Exeter, St. James, Stuart, Berkeley, Clarendon, Marlborough, Beacon, and Newbury streets, and Commonwealth Avenue.

Roadways within the study area providing direct access to and from the immediate vicinity of the site include: West Newton, Dalton, Belvidere, and Blagden streets; and North, South, and East Ring roads. All of the above roadways were used for the assignment of future vehicle trips through the study area.

2.1.2 Existing Traffic Volumes

Vanasse Hangen Brustlin, Inc. (VHB) conducted mechanical and manual traffic counts in September and October 1988. These were supplemented with additional traffic data collected in the Back Bay and South End neighborhoods and compiled from the following reports:

- o Transportation Status Report (August 1987) prepared by HMM Associates, Inc. and Cambridge Systematics, Inc.
- o An unpublished draft of the 25 Huntington Avenue Transportation Access Plan prepared by VHB
- o 116 Huntington Avenue Final Environmental Impact Report (FEIR), EOE #5777 (March 1987), prepared by Skidmore, Owings and Merrill in association with VHB
- o 500 Boylston Street Project FEIR (February 1985) prepared by Skidmore, Owings and Merrill in association with VHB
- o Hynes Auditorium FEIR, EOE #5046 (November 15, 1984), prepared by HMM Associates, Inc. and VHB

Existing average weekday daily traffic (AWDT) volumes, average Saturday daily traffic (ASDT) volumes, peak hour traffic volumes, and the percent of daily traffic occurring in the peak hours are shown in Table III-3. Of the locations listed, Huntington Avenue experiences the greatest AWDT, approximately 24,000 vehicles per day. East Ring Road experiences the lowest AWDT of the listed locations, approximately 6,000 vehicles per day. During the morning peak hour, the percent of AWDT ranges from about 4.1 percent on East Ring Road to about 6.2 percent on Huntington Avenue. The peak hour percentage is greater at all locations during the evening peak hour than in the morning peak hour. The percent of AWDT in the evening peak hour ranges from approximately 5.7 percent on Boylston Street to approximately 7.8 percent on Newbury Street, Huntington Avenue, and East Ring Road. On East Ring Road and Newbury Street, the evening peak hour percent is almost twice that of the morning peak hour, 4.1 percent versus 7.8 percent and 4.4 percent versus 7.8 percent, respectively. Generally, the weekday morning peak hour occurred from 8:00 AM to 9:00 AM, while the evening weekday peak hour occurred from 5:00 PM to 6:00 PM.

On Saturday, the average daily traffic was slightly lower than the AWDT on Boylston Street and about 28 percent greater than the AWDT on Newbury Street. The greater daily traffic on Newbury Street on Saturday may be attributed to the retail establishments along Newbury Street which typically generate a significant volume of Saturday traffic. The percent of Saturday daily traffic which occurs in the midday peak hour is comparable to the weekday morning peak hour, but less than the weekday evening peak hour. The midday Saturday peak hour generally occurred from 2:00 PM to 3:00 PM.

Table III-4 lists the directional distribution of peak hour volumes on two-way roadways adjacent to the site. In contrast to the typical situation for most two-way roadways, Belvidere Street, Dalton Street, and East Ring Road have the same peak direction of travel in both the morning and evening peak hours. This may result from the one-way eastbound flow on Boylston Street that essentially establishes a clockwise circulation pattern around the Prudential Center. This is reflected in the predominantly northbound flow on Dalton Street, the southbound flow on East Ring Road, and the westbound flow on Belvidere Street.

TABLE III-3
EXISTING TRAFFIC VOLUMES

Location	AWDT*	Weekday		Evening Peak Hour		Saturday	
		Morning Peak Hour Volume	Percent of AWDT	Volume	Percent of AWDT	Midday Peak Hour Volume	Percent of ASDT
Belvidere Street east of Dalton Street**	15,195	875	5.8%	1,080	7.1%		
Boylston Street east of Gloucester Street	20,555	1,045	5.1	1,175	5.7	1,050	5.7
Dalton Street south of Scotia Street***	13,205	770	5.8	830	6.3		
East Ring Road north of Huntington Avenue***	5,900	240	4.1	460	7.8		
Huntington Avenue east of Massachusetts Avenue***	23,950	1,490	6.2	1,865	7.8		
Newbury Street east of Gloucester Street	6,620	290	4.4	515	7.8	435	5.1
South Ring Road east of Belvidere Street	8,965	550	6.1	555	6.2		

* Average Weekday Daily Traffic.

** Average Saturday Daily Traffic.

*** Two-way street.

TABLE III-4
DIRECTIONAL DISTRIBUTION
OF PEAK HOUR TRAFFIC

<u>Location</u>	<u>Morning Peak Hour</u>	<u>Evening Peak Hour</u>
Belvidere Street East of Dalton Street	86% Westbound	75% Westbound
Dalton Street South of Scotia Street	78% Northbound	67% Northbound
East Ring Road North of Huntington Avenue	54% Southbound	57% Southbound
Huntington Avenue East of Massachusetts Avenue	51% Eastbound	57% Westbound

Only Huntington Avenue shows the reversal of peak direction from morning to evening peak hour which is usually characteristic of commuter patterns. The eastbound peak direction in the morning along Huntington Avenue corresponds to flow of commuters toward Downtown Boston and the westbound peak direction in the evening corresponds to the commuter flow out of Downtown. Directional distribution along Huntington Avenue, however, shows an almost even split during the morning peak hour, reflecting the strength of the clockwise flow (westbound along Huntington Avenue) around the Prudential Center.

Belvidere Street experiences the highest directional traffic flow in both peak periods, 86 percent during the morning peak hour and 75 percent during the evening peak hour. The lowest peak direction percentage is on Huntington Avenue in the morning with 51 percent eastbound. As noted earlier, Boylston Street, Newbury Street, and South Ring Road are all one-way streets and, thus, have 100 percent of their volume in one direction.

2.1.3 Existing Traffic Operating Conditions

Signalized Intersection Level-of-Service Analysis Procedure

Level of service (LOS) is the term used to denote the different operating conditions that occur at a given intersection when accommodating various volumes of traffic. It is a qualitative measure of the effect of a number of factors, including roadway geometrics, travel delay, freedom to maneuver, and safety. Level of service provides an index to the operational qualities of a roadway intersection.

Level of service is represented on a scale ranging from LOS A at the highest level to LOS F at the lowest level. Intersections rated at LOS A represent a free-flow operating condition. Typically, the intersection approach appears quite open and turning movements are made easily with minimal or no delay. Levels-of-service B through D represent increasingly restricted movement and greater delay. Capacity of the intersection occurs at the lower end of LOS E, which is characterized by long queues of vehicles waiting to pass through the intersection. Level-of-service F indicates jammed conditions and represents traffic demands in excess of capacity.

Levels of service for signalized intersections were determined using the Critical Movement Analysis procedure as defined in the Transportation Research Circular Number 212, Interim Materials on Highway Capacity, published by the Transportation Research Board, Washington, D.C., dated January 1986. This procedure compares lane use on critical approaches to the total capacity of an intersection. The ratio of volume-to-capacity (v/c) is inversely related to level of service, i.e., as the volume-to-capacity ratio increases toward 1.0 (volume equal to capacity), level of service declines to E. Level-of-service F represent volumes in excess of capacity. Generally, LOS E and F are considered deficient in urban areas and any location at or above LOS D is considered acceptable. Level-of-service criteria for signalized intersections are shown in Table III-5. Additional information about the level-of-service analysis is presented in the Appendix.

TABLE III-5
LEVEL-OF-SERVICE CRITERIA
SIGNALIZED INTERSECTIONS

<u>Level of Service</u>	<u>V/C* Ratio</u>	<u>Traffic Flow Description</u>
A	0.00-0.60	Free flow
B	0.61-0.70	Stable flow
C	0.71-0.80	Stable flow with some restriction
D	0.81-0.90	Approaching unstable flow
E	0.91-1.00	Unstable flow and long queues
F	Varies	Forced flow

* Volume-to-capacity ratio.

Source: Transportation Research Circular Number 212, Interim Materials on Highway Capacity; Transportation Research Board; Washington, D.C. (January 1980).

The level-of-service analysis procedure, however, does not always produce results consistent with casual observation of roadway conditions. This is because the procedure focuses the overall operation of the intersection. Individual approaches to the intersection may operate at a higher or lower level of service than the intersection as a whole. Thus, an intersection may have an overall level of service that is acceptable, while having one approach that is deficient.

Another factor is that the procedure focuses on individual intersections and does not include external factors that may impact intersection operations. The procedure is designed to identify any deficiencies with geometry, lane use, and signal phasing at the intersection being analyzed so that steps can be identified to correct deficiencies. The procedure does not flag an intersection as being deficient when operational problems result from factors external to the intersection and the solution to the problem can be found in making improvements elsewhere. For example, if traffic queues from an adjacent intersection cause jammed conditions at the

intersection being analyzed, the analysis intersection would not be identified as being deficient because the problem cannot be relieved by improving the intersection. Instead, the adjacent intersection must be improved to eliminate the queues causing the operational problems. Similarly, double-parking and construction activity, which blocks departure lanes, cannot be addressed by improving the intersection itself. Because of this consideration, the level-of-service analysis is supplemented by an analysis of conditions along the various corridors where study intersections are located.

The Circular 212 procedure was selected as the method of analysis for two reasons. First, the Prudential Center Redevelopment project will take ten years to complete and the Circular 212 method is a good generalized technique for long-range planning when specific intersection operating characteristics are less likely to be known. Second, the Circular 212 method does not rely on detailed information about signal timing, which will be subject to significant change at many analysis locations. Currently, the city of Boston is installing a centralized computer system to control traffic signals throughout downtown Boston and Back Bay. The new system will be responsive to actual demands at intersections and will vary signal timing to respond to specific conditions. The programming of this new system is not complete, therefore, it is impossible to know what signal timing will be at specific intersections in 1994 and 1999. As a result, the Circular 212 method offered the best procedure for comparing conditions for the various analysis scenarios.

Unsignalized Intersection Level-of-Service Analysis Procedure

Levels of service for unsignalized intersections were determined using a computer program based on procedures outlined in the 1985 Highway Capacity Manual, Special Report 209, published by the Transportation Research Board, Washington, D.C. Level of service for unsignalized intersections is based on the assumption that major street traffic is not affected by minor street movements (i.e., minor street traffic must wait for a gap in major street traffic). The capacity of the intersection to accommodate minor street movements is based on the amount of

traffic on the major street and the configuration of the intersection. The volume for each side street movement is subtracted from the calculated capacity to determine the available reserve capacity (ARC). The smaller the available reserve capacity, the lower the level of service. Volumes in excess of capacity result in a negative value for available reserve capacity and represent LOS F. Level-of-service criteria for unsignalized intersections are shown in Table III-6.

TABLE III-6
LEVEL-OF-SERVICE CRITERIA
UNSIGNALIZED INTERSECTIONS

<u>Available Reserve Capacity*</u>	<u>Level of Service</u>	<u>Expected Traffic Delay</u>
400 or more	A	Little or no delay
300 to 399	B	Short traffic delays
200 to 299	C	Average traffic delays
100 to 199	D	Long traffic delays
0 to 99	E	Very long traffic delays
Less than 0	E	Failure; extreme congestion
Any Value	F	Intersection blocked by external causes

* Vehicles per hour.

Sources: Transportation Research Circular Number 212, Interim Materials on Highway Capacity (January 1980) and 1985 Highway Capacity Manual, Special Report 209 (1985); Transportation Research Board; Washington, D.C.

Caution should be used in the interpretation of the delay associated with unsignalized level-of-service criteria. The expected delays are stated in general terms, without specific numeric values. Unsignalized levels of service are not associated with the delay values given for signalized intersections. Level-of-service F indicates that there are insufficient gaps of suitable size to allow side or minor street demand to safely enter or cross the major street traffic. This is

generally evident by long delays and possibly by queuing on the minor street. Level-of-service F also may result in side street vehicles accepting smaller than usual gaps. In such cases, safety may be compromised and some disruption to the major street traffic can result. It should be noted that the major street traffic can still move effectively at LOS F and only side street traffic may experience difficulty.

Level-of-service F conditions usually warrant investigation into possible improvements to the intersection. The most common form of improvement in such situations is installation of a traffic signal to provide a break in main street traffic to allow side street traffic to move. Such an improvement may not be warranted or desirable if side street volumes are low. A further consideration as to the desirability of such an improvement is that installation of a signal will increase delay to the major street traffic.

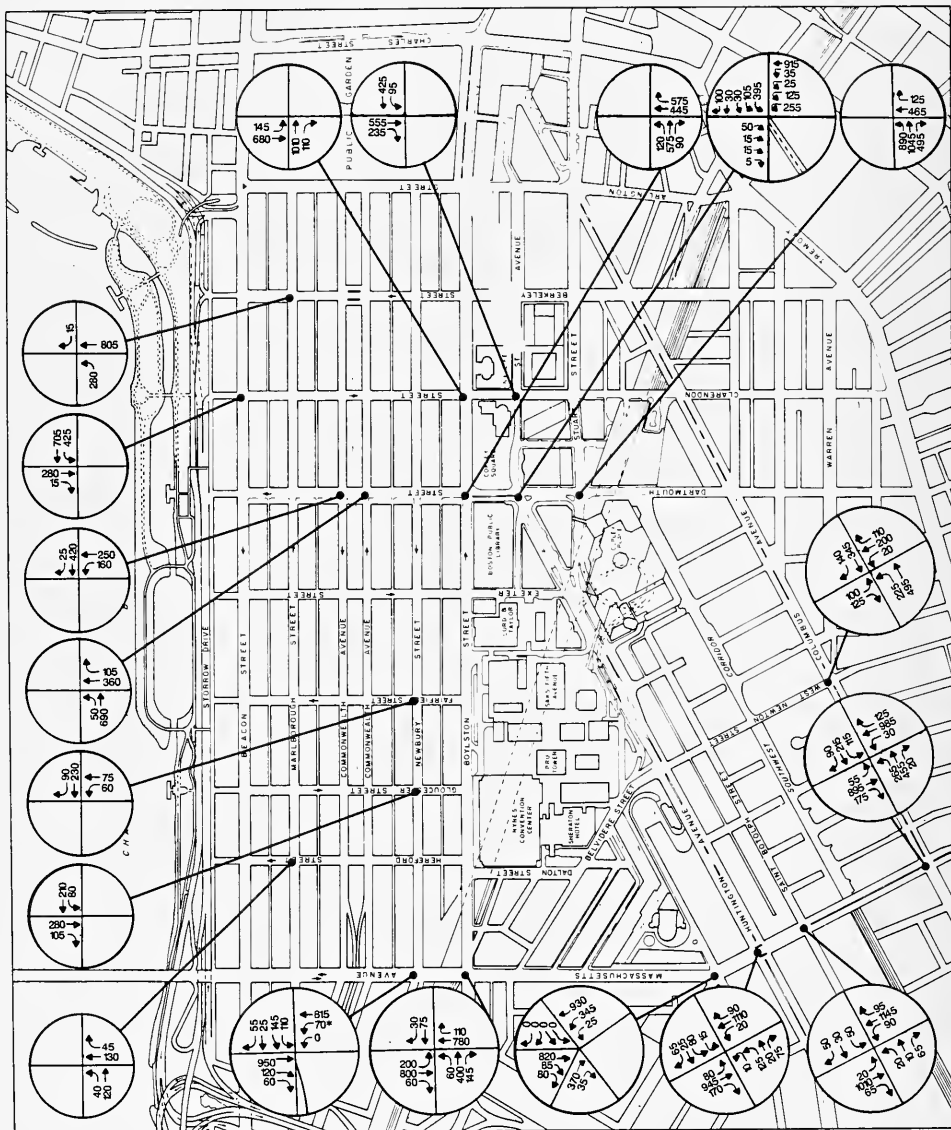
Existing Level-of-Service Summary

Level-of-service analyses were performed for a total of twenty-nine intersections in the study area. Of those, twenty locations were signalized and nine were unsignalized. The scopes issued by the BRA and MEPA identified twenty-four intersection analysis locations. An additional five unsignalized locations surrounding the Prudential site were also analyzed because direct access to or egress from the site is provided at each of these locations.

Figures III-3A, III-3B, III-4A, III-4B, and III-5 show existing turning movements at the analysis intersections in the study area. Figures III-3A and III-3B show the morning peak hour, Figures III-4A and III-4B show the evening peak hour, and Figure III-5 shows the Saturday midday hour. The traffic volumes shown in these figures were analyzed to determine existing conditions and form the base upon which future traffic conditions are projected. Tables III-7 and III-8 list the morning, evening, and Saturday LOS results for signalized and unsignalized intersections, respectively.

Prudential Center Redevelopment

Fig. III-3A Existing AM Peak Hour Traffic Volumes



0 200 400
Scale Feet

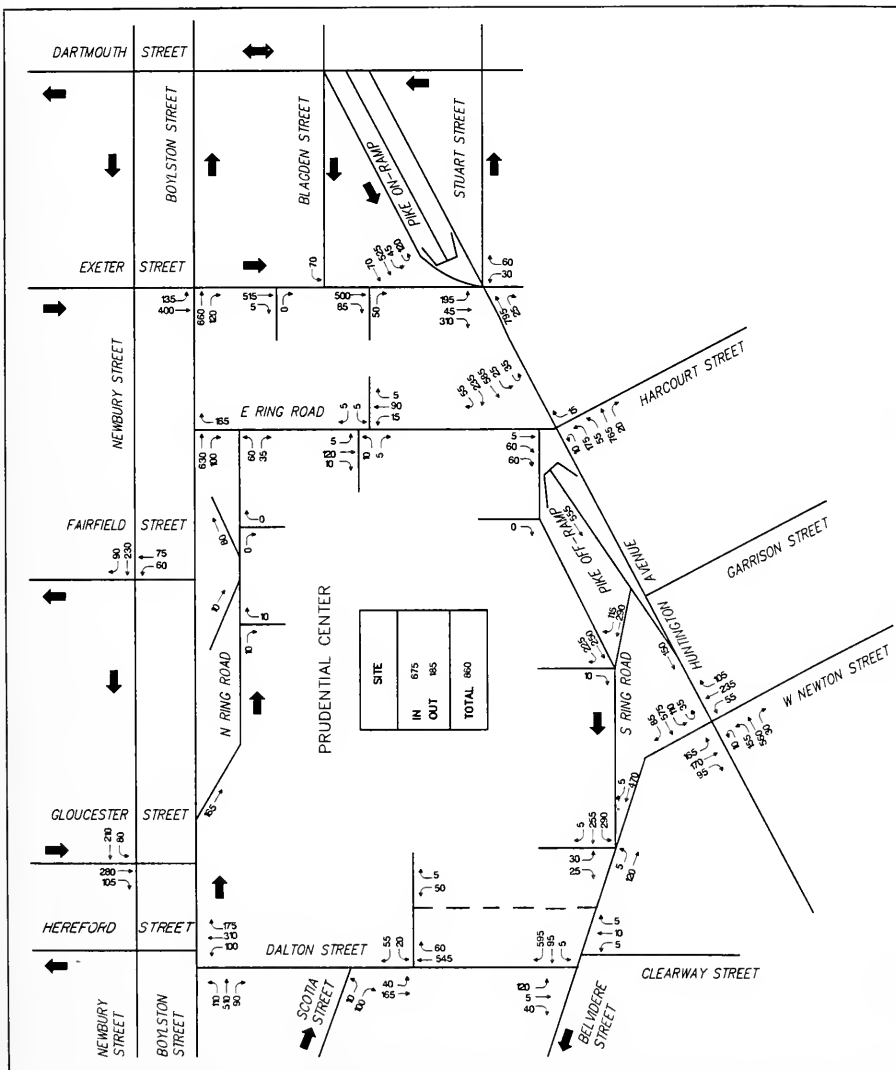


Prudential Center Redevelopment

Fig. III-3B Existing AM Peak Hour Traffic Volumes

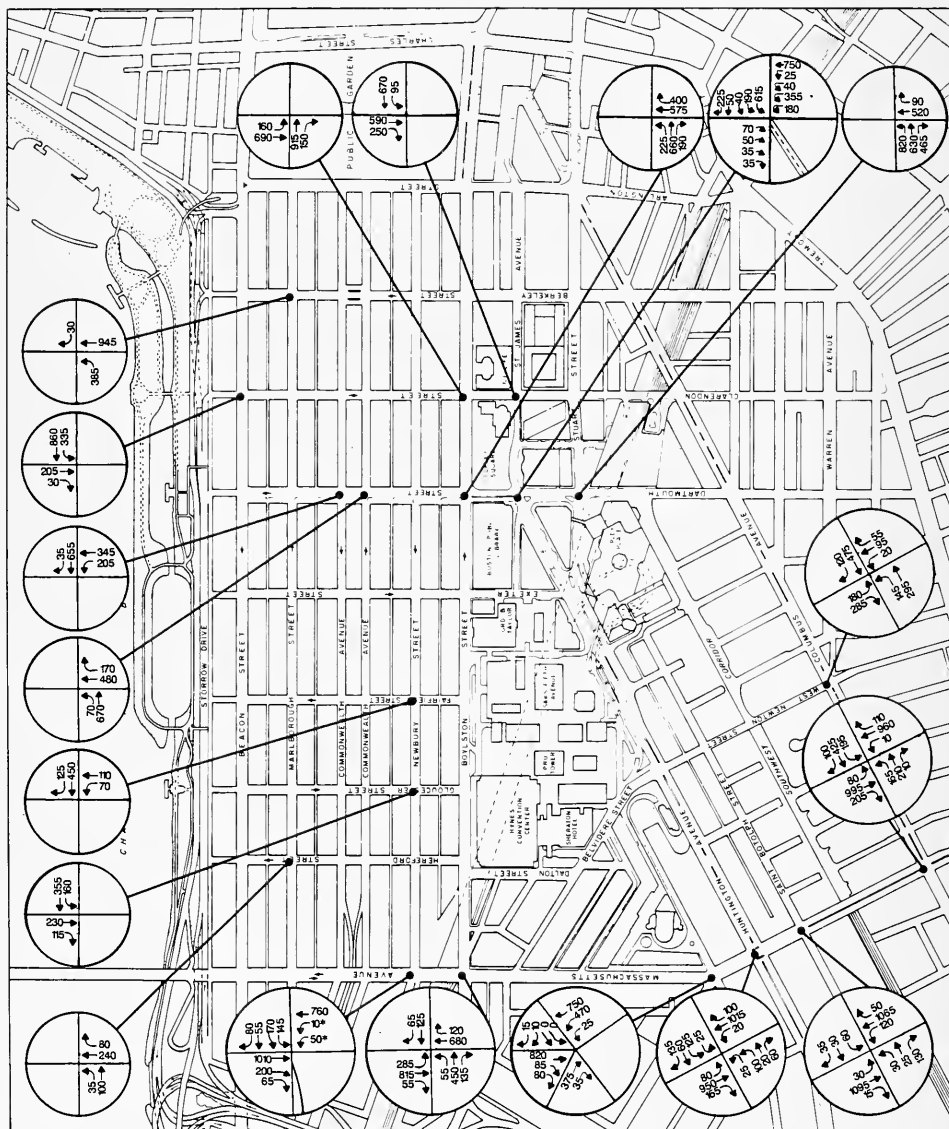


0 200 400
Scale: Feet



Prudential
Center
Redevelopment

Fig. III-4 A
Existing
PM Peak Hour
Traffic Volumes

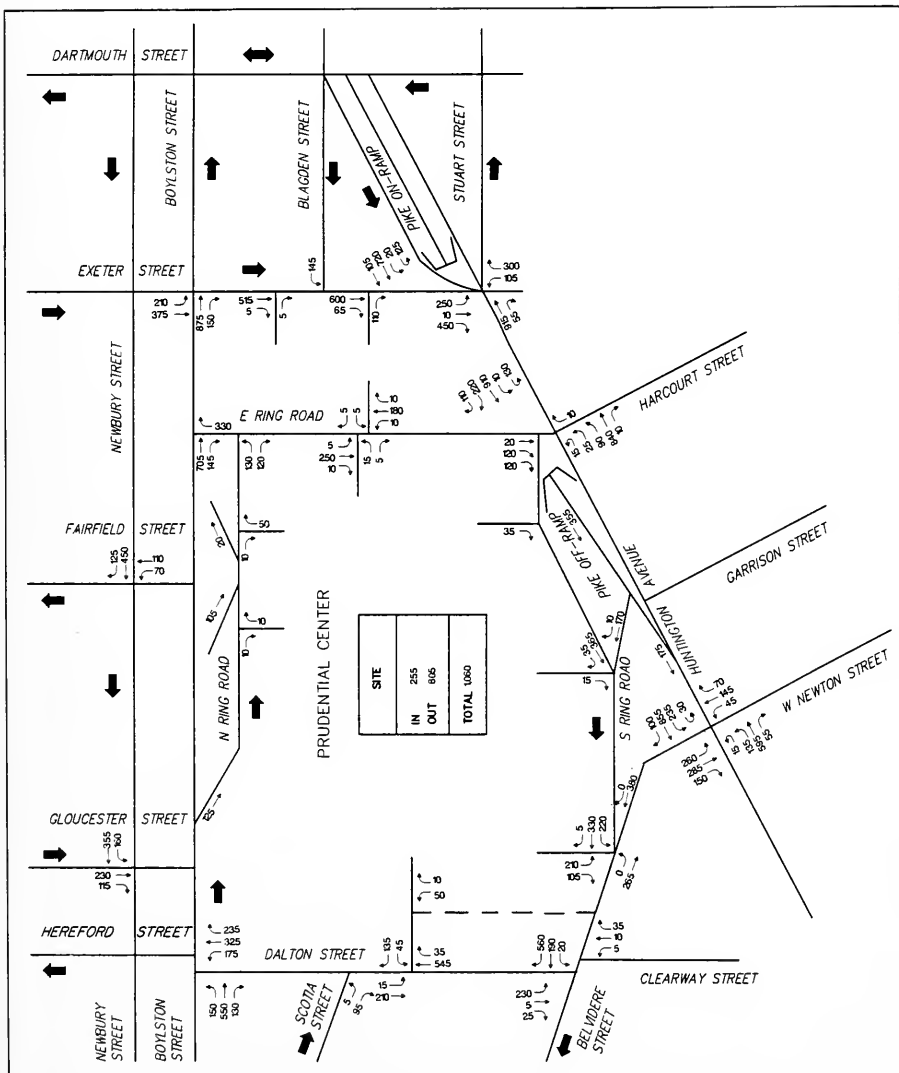


Prudential Center Redevelopment

Fig. III-4B Existing PM Peak Hour Traffic Volumes



III-25



Saturday Peak Hour Traffic Volumes



TABLE III-7
EXISTING SIGNALIZED INTERSECTION
LEVEL OF SERVICE

Location Number	Description	<u>AM Peak</u>		<u>PM Peak</u>		<u>Saturday Peak</u>	
		<u>ARC*</u>	<u>LOS**</u>	<u>ARC</u>	<u>LOS</u>	<u>ARC</u>	<u>LOS</u>
1	Boylston St. and Clarendon St.	0.61	B	0.61	B		
2	St. James Ave. and Clarendon St.	0.44	A	0.56	A		
3	Boylston St. and Dartmouth St.	0.60	B	0.56	A		
4	Huntington Ave., Dartmouth St., St. James Ave., and Blagden St.	0.45	A	0.62	B		
5	Stuart St. and Dartmouth St.	0.68	B	0.78	C		
6	Boylston St. and Exeter St.	0.49	A	0.57	A	0.50	A
7	Huntington Ave., Exeter St., and Stuart St.	0.56	A	0.74	C	0.52	A
8	Huntington Ave., East Ring Rd., and Harcourt St.	0.63	B	0.69	B	0.40	A
9	Huntington Ave., West Newton St., and Belvidere St.	0.68	B	0.82	D	0.56	A
10	Columbus Ave. and West Newton St.	0.84	D	0.87	D		
11	Mass. Ave. and Columbus Ave.	0.85	D	0.93	E		
12	Mass. Ave. and Huntington Ave.	0.71	C	0.72	C		

* Volume-to-capacity ratio.

** Level-of-service.

TABLE III-7 (Continued)
EXISTING SIGNALIZED INTERSECTION
LEVEL OF SERVICE

<u>Location Number</u>	<u>Description</u>	<u>AM Peak</u>		<u>PM Peak</u>		<u>Saturday Peak</u>	
		<u>V/C*</u>	<u>LOS**</u>	<u>V/C</u>	<u>LOS</u>	<u>V/C</u>	<u>LOS</u>
13	Mass. Ave., Westland Ave., and St. Stephens St.	0.91	E	0.85	D		
14	Mass. Ave. and Boylston St.	0.61	B	0.70	C		
15	Mass. Ave. and Newbury St.	0.60	B	0.69	B		
16	Boylston St., Dalton St., and Hereford St.	0.50	A	0.60	B	0.41	A
19	Mass. Ave. and St. Botolph St.	0.67	B	0.81	D		
21	Dartmouth St. and Commonwealth Ave.						
	North	0.30	A	0.43	A		
	South	0.42	A	0.48	A		
23	Berkeley St. and Marlborough St.	0.40	A	0.49	A		
24	Beacon St. and Clarendon St.	0.40	A	0.36	A		

* Volume-to-capacity ratio.

** Level-of-service.

TABLE III-8
EXISTING UNSIGNALIZED INTERSECTION
LEVEL OF SERVICE

Location Number	Description	<u>AM Peak</u>		<u>PM Peak</u>		<u>Saturday Peak</u>	
		<u>ARC*</u>	<u>LOS**</u>	<u>ARC</u>	<u>LOS</u>	<u>ARC</u>	<u>LOS</u>
17	Newbury St. and Gloucester St.	301	B	148	D	260	C
18	Newbury St. and Fairfield St.	574	A	241	C	444	A
20	Belvidere St. and Dalton St.	596	A	366	B	650	A
22	Hereford St. and Marlborough Garage Access Locations	565	A	386	B		
25	Belvidere St. and Garage	316	B	-13	F***		
25	Belvidere St. and South Ring Rd.	101	D	110	D***		
26	Dalton St. and Scotia St.	589	A	499	A		
27	Exeter St., Blagden St., and Garage	508	A	263	C		
28	North Ring Rd. and East Ring Rd.	705	A	507	A		

* Available reserve capacity in vehicles per hour.

** Level-of-service.

*** LOS improved by traffic officer control.

In the morning peak hour, twenty-eight of the twenty-nine intersections are currently operating at acceptable conditions overall (LOS D or better). The intersections of Columbus Avenue and West Newton Street, Massachusetts Avenue and Columbus Avenue, and Belvidere Street and South Ring Road are presently operating at LOS D. Level-of-service D represents the 2192/489/wpr-HT4

upper limit of acceptable conditions. The intersection of Massachusetts Avenue, Westland Avenue, and St. Stephens Street (adjacent to Symphony Hall and the Christian Science Church) is the only intersection operating at an unacceptable LOS in the morning peak hour (LOS E). This LOS is due primarily to the delay experienced by eastbound vehicles on Westland Avenue which queue in a single approach lane. Northbound left-turning vehicles on Massachusetts Avenue also experience some delay at this location.

In the evening peak hour, twenty-seven of the twenty-nine study intersections are presently operating at acceptable levels of service. In addition, the following intersections are currently operating at LOS D:

- o Huntington Avenue, West Newton Street, and Belvidere Street
- o Columbus Avenue and West Newton Street
- o Massachusetts Avenue, Westland Avenue, and St. Stephens Street
- o Massachusetts Avenue and Boylston Street
- o Massachusetts Avenue and St. Botolph Street
- o Newbury Street and Gloucester Street
- o Belvidere Street and South Ring Road

The intersections of Massachusetts Avenue and Columbus Avenue, and Belvidere Street and the Prudential Center Garage are currently operating at deficient levels of service in the evening peak hour. At the Columbus Avenue and Massachusetts Avenue intersection, the southbound approach on Massachusetts Avenue experiences very long delays due to heavy demand on the two approach lanes. This problem is compounded by vehicles that park illegally in the designated bus stop forcing both MBTA and city of Boston school buses to block the one legal through travel lane when picking up or discharging passengers. The queue on this approach often extends back to St. Botolph Street, thus, interfering with the operation of that intersection.

Because of heavy volume along Belvidere Street, traffic exiting the Prudential garage is subject to delay. To address this problem, police officer control has been instituted at the Belvidere Street garage exit, the main exit from the South Garage. As a result, both the

unsignalized intersections of Belvidere Street and the Prudential Center Garage exit, and Belvidere Street and South Ring Road effectively function as one signalized intersection. Under police officer control, the intersection currently operates under acceptable conditions (LOS D); without police control, it would function unacceptably.

In addition to the overall intersection deficiencies noted above, several intersections have problems occurring on particular approaches.

- o In the evening peak hour at Massachusetts Avenue, Westland Avenue, and St. Stephens Street, northbound left-turning vehicles on Massachusetts Avenue experience delays, as in the morning peak hour. The northbound left-turning traffic often queues back to Huntington Avenue, blocking the westbound departure lanes on Huntington Avenue.
- o The eastbound and northbound approaches to the intersection of Massachusetts Avenue and Boylston Street experience delays. Problems on the eastbound Boylston Street approach appear to result from double-parking, pedestrian conflicts, and insufficient green time. Eastbound vehicles on Boylston Street often queue back to Ipswich Street. On the northbound Massachusetts Avenue approach, double-parked vehicles sometimes block the through-right travel lane.
- o Although the intersection of Huntington Avenue, Belvidere Street, and West Newton Street operates acceptably overall in the evening peak period, northbound vehicles on West Newton Street sometimes queue back to the four-way stop at St. Botolph Street. This, combined with the queuing of southbound vehicles back from Columbus Avenue, contributes to congestion on West Newton Street and to vehicle delays on St. Botolph Street. Ongoing MBTA construction and repair work along Huntington Avenue at West Newton Street and Belvidere Street, currently contribute to additional delay for eastbound and westbound vehicles.

Other Existing Operational Deficiencies

Intersection level-of-service analysis alone is not enough to identify all the operational deficiencies that occur on the roadway system within the study area. Observations of operating conditions along roadway links between analysis locations reveal other deficiencies that may contribute to delay and congestion. Table III-9 lists a series of deficiencies identified for several corridors in the study that are not reflected in the level-of-service analysis presented above. Roadways identified include Massachusetts Avenue, West Newton Street, Boylston Street, Newbury Street, Berkeley Street, and Huntington Avenue.

In addition to the level-of-service deficiencies noted above at the intersection of Columbus Avenue and Massachusetts Avenue, other intersections and sections of roadway along Massachusetts Avenue experience operational problems that slow travel along that roadway. Among these factors are a large volume of traffic, inadequate signal progression between intersections, illegal parking in bus stops, temporary impacts from building construction, lack of exclusive left-turn lanes, illegal left-turns, double-parking of delivery vehicles, and lane restrictions on the Harvard Bridge. All of these factors serve to reduce existing roadway capacity and contribute to increased travel delays. The last problem will be eliminated within two years after repairs are completed on the bridge. Furthermore, signal progression along Massachusetts Avenue can be improved when the installation of the city's new signal system is complete.

Problems along West Newton Street include one narrow travel lane in each direction, inadequate green time at signals, close intersection spacing, and poor pavement conditions. Additionally, because West Newton Street serves as a short-cut for drivers traveling southbound, West Newton Street experiences a heavy volume of traffic. Along Newbury and Boylston streets, the major problem is the extensive amount of double-parking that takes place on both sides of the street. Construction and downstream congestion also add to operational problems on Boylston Street, while congestion along Massachusetts Avenue adds to delays for vehicles exiting Newbury Street.

TABLE III-9
OTHER ROADWAY DEFICIENCIES

- o Massachusetts Avenue:
 - Traffic Volume
 - Signal Progression
 - Illegal Parking at Bus Stops
 - Building Construction
 - Lack of Left-Turn Bays
 - Illegal Left-Turns
 - Lane Restriction on Harvard Bridge
 - Double-Parking of Delivery Vehicles
- o West Newton Street:
 - Single Travel Lane
 - Signal Timing
 - Close Intersection Spacing
 - Condition of Pavement
- o Boylston Street:
 - Double-Parking on Both Sides
 - Downstream Congestion
 - Building Construction
- o Newbury Street:
 - Double-Parking on Both Sides
 - Congestion on Massachusetts Avenue
- o Berkeley Street:
 - Signal Progression
 - Downstream Congestion
 - Illegal Parking on Berkeley Street Approaching Beacon Street
- o Huntington Avenue:
 - Double-Parking
 - Construction of MBTA Ventilation Shafts

At the Berkeley Street and Marlborough Street intersection, vehicles traveling northbound along Berkeley Street may experience delays because of various factors not associated with that particular intersection. These include northbound vehicles queuing from Beacon Street back to Marlborough Street, the northbound surge of traffic from Commonwealth Avenue, and the inadequate synchronization and progression of signals along Berkeley Street between Commonwealth Avenue and Beacon Street.

Saturday Analysis

Vanasse Hangen Brustlin, Inc. analyzed eight intersections around the perimeter of the Prudential Center for Saturday midday peak hour conditions as required by the BRA and MEPA scopes. Saturday midday counts were conducted between 1:30 and 3:30 PM. This time period was selected based on the results of the Saturday 24-hour automatic traffic recorder (ATR) counts conducted along Boylston Street and Huntington Avenue adjacent to the Prudential Center and along Newbury Street between Fairfield and Gloucester streets.

Boylston and Newbury streets were selected because of their extensive retail activities and because they are typically busy on Saturday. Huntington Avenue was counted because it is adjacent to the Center and includes three of the Saturday analysis locations. The ATR counts showed that Saturday traffic peaked twice, once between 1:30 PM and 3:30 PM and next between 7:00 PM and 9:00 PM. The afternoon peaking pattern was confirmed from an analysis of the Prudential Center Garage entering and exiting movements which peaked between 1:30 and 2:30 PM.

Peak period turning movement counts were conducted for all the intersections except the intersection of Huntington Avenue, West Newton Street, and Belvidere Street for which the counts were taken from the Profile of Existing Transportation Conditions in the Back Bay, prepared by HMM Associates, Inc. and Cambridge Systematics, Inc., dated September 1987.

Results of the Saturday level-of-service analysis are provided in Tables III-7 and III-8 presented earlier. All the Saturday analysis locations are operating at LOS A, except for the Newbury Street and Gloucester Street intersection which is operating at LOS C. As with the observation of weekday conditions, double-parking was observed on Newbury Street during the Saturday midday period. At times, cars double-parked on both sides of the street forcing traffic to essentially weave its way through.

2.1.4 Travel Times

Travel times provide a measure of performance that can be used to evaluate the effectiveness of streets in handling existing traffic volumes and to assess the relative attractiveness of routes to accommodate future travel demand. Travel times were recorded over selected alternative routes between Prudential Center Garage entrances and access points to the regional highway system. The purpose of these runs is to determine which routes provide the shortest travel times during peak. The results are then considered in the assignment of project and background trips through Back Bay and South End neighborhoods. Travel routes are shown in Figures III-6 and III-7 for the morning and evening peak periods, respectively.

Travel routes were typically measured a minimum of six times on at least two separate days during the peak periods. The morning peak period runs were measured between 7:00 and 9:00 AM, while the evening peak period runs were measured between 3:30 and 6:00 PM. The average times for each route in the morning and evening peak periods are shown in Tables III-10 and III-11, respectively. It should be noted that most morning inbound travel routes do not have a corresponding outbound route in the evening because of the one-way street patterns within the study area.

Prudential Center Redevelopment

Fig. III-7 PM Peak Period Travel Time Runs (Outbound)

LEGEND:

- ☒ Travel Route No.
- Starting Point

0 200 400
Scale feet

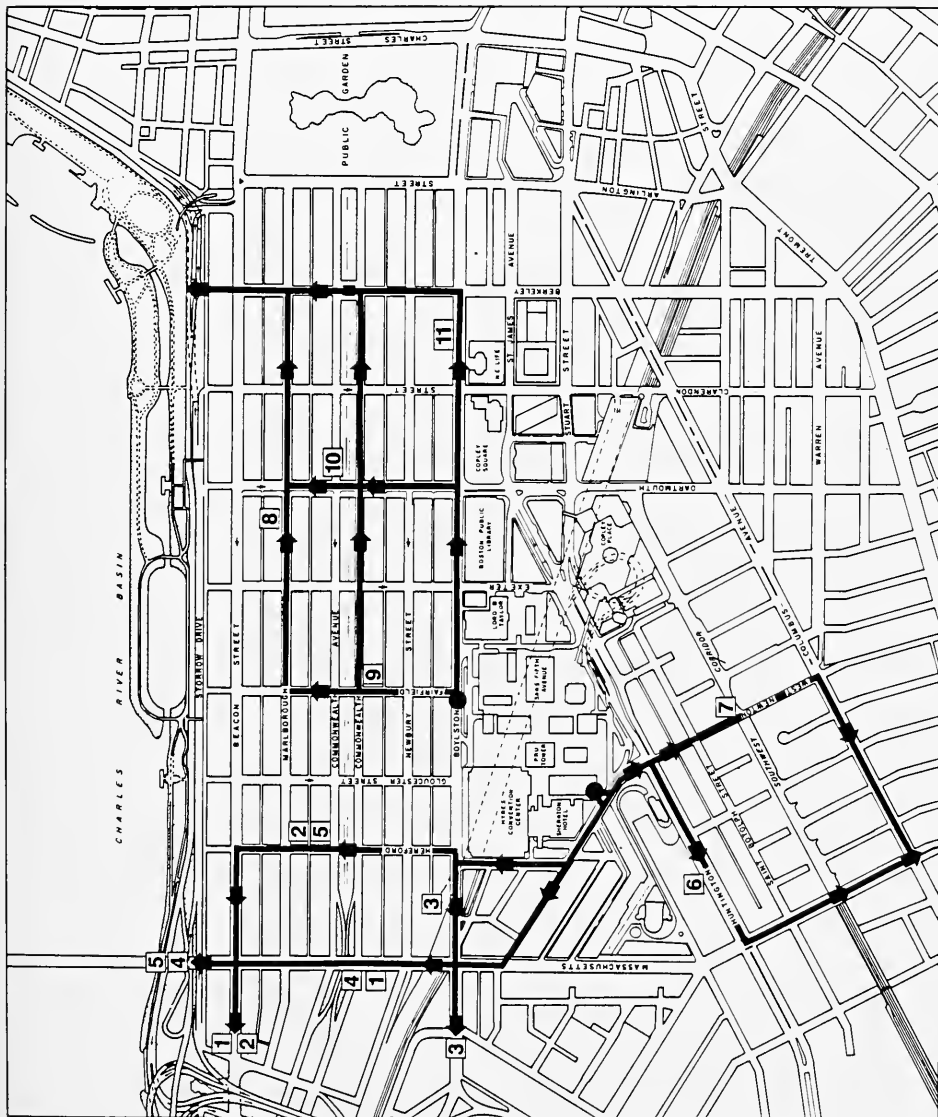


TABLE III-10
AVERAGE TRAVEL TIME
MORNING PEAK PERIOD INBOUND

<u>Route</u>	<u>Time (Min:Sec)</u>	<u>Number of Runs</u>	<u>Running Speed (Miles/Hour)</u>
Massachusetts Avenue at Columbus Avenue to North Garage Entrance:			
1. Massachusetts Avenue - Boylston Street	4:02	6	20
2. Massachusetts Avenue - Huntington Avenue - Belvidere Street - Dalton Street - Boylston Street	5:10	6	14
3. Columbus Avenue - West Newton Street - Belvidere Street - Dalton Street - Boylston Street	4:51	6	25
Storrow Drive at Arlington Street to South Garage Entrance:			
4. Beacon Street - Clarendon Street - St. James Avenue - Huntington Avenue - South Ring Road	5:03	6	17
5. Arlington Street - St. James Avenue - Huntington Avenue - South Ring Road	5:23	6	17
6. Beacon Street - Exeter Street - Huntington Avenue - South Ring Road	4:56	7	20
Storrow Drive at Arlington Street to North Garage Entrance:			
7. Beacon Street - Gloucester Street - Boylston Street	5:13	7	17

TABLE III-11
AVERAGE TRAVEL TIME
EVENING PEAK PERIOD OUTBOUND

<u>Route</u>	<u>Time (Min:Sec)</u>	<u>Number of Runs</u>	<u>Running Speed (Miles/Hour)</u>
South Garage Exit to Storrow Drive Westbound:			
1. Belvidere Street - Massachusetts Avenue - Beacon Street	8:03*	10	18
2. Belvidere Street - Dalton Street - Hereford Street - Beacon Street	5:54	6	12
3. Belvidere Street - Dalton Street - Boylston Street - Park Drive	4:20	5	23
South Garage Exit to Harvard Bridge, Cambridge:			
4. Belvidere Street - Massachusetts Avenue - Beacon Street	11:09**	10	7
5. Belvidere Street - Dalton Street - Hereford Street - Beacon Street	6:05	4	16
South Garage Exit to Massachusetts Avenue at Columbus Avenue:			
6. Belvidere Street - Huntington Avenue - Massachusetts Avenue	5:15	6	17
7. Belvidere Street - West Newton Street - Columbus Avenue	4:05	6	17
Boylston Street to Berkeley Street at Marlborough Street:			
8. Boylston Street - Fairfield Street - Marlborough Street - Berkeley Street	4:26	6	20
9. Boylston Street - Fairfield Street - Commonwealth Avenue - Berkeley Street	4:53	6	18
10. Boylston Street - Dartmouth Street - Marlborough Street - Berkeley Street	3:50	6	20
11. Boylston Street - Berkeley Street	5:31	6	16

* Travel times varied widely from 2:38 to 19:15.

** Travel times varied widely from 3:13 to 25:15.

2192/489/wpr-HT4

During the morning, travel routes were measured from two major access points into the study area: Storrow Drive at Arlington Street used by vehicles from the north and northeast, and the intersection of Massachusetts Avenue and Columbus Avenue for vehicles from the southeast and southwest. Four routes were measured from Storrow Drive at Arlington Street: three routes to the Prudential Center South Garage entrance and one route to the Prudential Center North Garage entrance. From the Massachusetts Avenue and Columbus Avenue intersection, travel times were recorded for three routes to the North Garage entrance.

During the morning, travel times from the intersection of Massachusetts Avenue at Columbus Avenue to the North Garage were considerably shorter via Massachusetts Avenue and Boylston Street (Route 1) than via Massachusetts Avenue, Huntington Avenue, and Belvidere Street (Route 2) or via Columbus Avenue, West Newton Street, and Belvidere Street (Route 3). On average, Route 1 was nearly 50 seconds faster than Route 2, and nearly 70 seconds faster than Route 3.

There was no clearly superior route inbound from Storrow Drive at Arlington Street in the morning. Three routes were measured: Arlington Street, Clarendon Street, and Exeter Street. All three routes average travel times within approximately 30 seconds of one another.

During the evening, travel times were recorded for various routes to four major access points to the regional highway system from the study area: Storrow Drive westbound, the Harvard Bridge, Storrow Drive eastbound via Berkeley Street, and the intersection of Massachusetts Avenue and Columbus Avenue. Three routes were timed from the South Garage to Storrow Drive westbound near Kenmore Square. Also measured from the South Garage were two routes each to the Harvard Bridge and to the Massachusetts Avenue and Columbus Avenue intersection. Data for four alternate routes to Storrow Drive at Berkeley Street were collected from a location on Boylston Street that is common to the routes used by vehicles parked in both the North and South Garages.

In the evening, Route 3 (Boylston Street and Park Drive) was the fastest route outbound towards Kenmore Square and Storrow Drive. Traveling towards Cambridge via the Harvard Bridge, Route 5 (Hereford and Beacon streets) was faster on average than was Route 6 (Massachusetts Avenue). It should be noted that congestion along Massachusetts Avenue may have been due, in part, to construction on the Harvard Bridge, particularly during the evening commuting period.

Traveling from the South Garage to the intersection of Massachusetts Avenue and Columbus Avenue in the evening, Route 7 (West Newton Street and Columbus Avenue) was 70 seconds faster than Route 6 (Huntington Avenue and Massachusetts Avenue). This is due to a long queue on Massachusetts Avenue southbound at the approach to Columbus Avenue.

Of the four travel routes measured from Boylston Street through the intersection of Berkeley Street at Marlborough Street, Route 10 along Marlborough and Dartmouth streets was the fastest route by a margin ranging from almost 40 to over 100 seconds. Travel times along Boylston Street to Berkeley Street were the longest of the alternate routes.

The above discussion highlights delays associated with some travel routes. The data indicate that some of the alternative neighborhood routes, e.g., West Newton Street and Marlborough Street, are faster than the respective major routes, e.g., Columbus Avenue and Berkeley Street. These minor routes effectively serve as short-cut alternatives and, therefore, can experience a relatively high volume of traffic during peak periods. The above travel time results were one factor considered in assigning future traffic in the study area. The Transportation Mitigation Plan presented later includes traffic operations improvements designed to encourage drivers to use the main arteries and to discourage driving on neighborhood streets.

2.2 Parking, Garage Access, and Loading

2.2.1 Parking

A large supply of public and private off-street parking is provided within the area. Most of the parking supply used for the Prudential Center is provided on-site in the Prudential Center Garage. A limited supply of metered on-street parking is also available.

The parking study for the proposed Prudential Center Redevelopment project broadly consisted of three major elements:

- o Study of the existing parking supply and use within the study area
- o Projection of parking supply and demand changes for the future project
- o Identification of a future parking management program

The results of the existing parking conditions analysis are summarized below.

Prudential Center Garage

Layout and Management

The Prudential Center Garage contains 3,028 spaces on three levels. Because the Prudential Center site is divided by the Massachusetts Turnpike, there are actually two independent garages which have no automobile connection between them (although there is a pedestrian connection beneath the Turnpike). The North Garage contains 1,253 spaces and the South Garage contains 1,775 spaces. Both garages contain some areas that are reserved for specific users (residents of the apartments, office tenants, etc.) and areas that are open to the general public. The number of parking spaces available in each garage and the current allocation by users are listed in Table III-12.

TABLE III-12
PRUDENTIAL CENTER GARAGE PARKING SPACES
BY USE

<u>Use</u>	<u>North</u>	<u>South</u>	<u>Total</u>
<u>Public:</u>			
Available all day*	406	1,381	1,787**
Available after 9:30 AM	<u>345</u>	<u>188</u>	<u>533</u>
Subtotal	751	1,569	2,320**
<u>Reserved:</u>			
Unassigned spaces	374	26	400
Assigned spaces	<u>128</u>	<u>180</u>	<u>308</u>
Subtotal	<u>502</u>	<u>206</u>	<u>708</u>
TOTAL	1,253	1,775	3,028

* Available all day to both long-term and short-term parkers.

** Includes 286 spaces designated for the Sheraton Hotel. Although the Sheraton Hotel area is physically segregated from other parking areas in the garage, access to the area is not restricted to Sheraton Hotel users only.

Figures III-8A, III-8B, and III-8C show the layout of the mezzanine (upper), street (middle), and lower levels, respectively, of the North Garage. The three levels and the allocation of spaces for the South Garage are depicted in Figures III-9A, III-9B, and III-9C.

There are two categories of reserved areas: those with assigned spaces and those with unassigned spaces. There are a total of 308 reserved assigned spaces. These include residential spaces on the mezzanine level of the North Garage and office tenant spaces on the street level of the South Garage. An additional 400 spaces of unassigned reserved spaces are also provided. In total, there are 708 reserved spaces.

Prudential Center Redevelopment

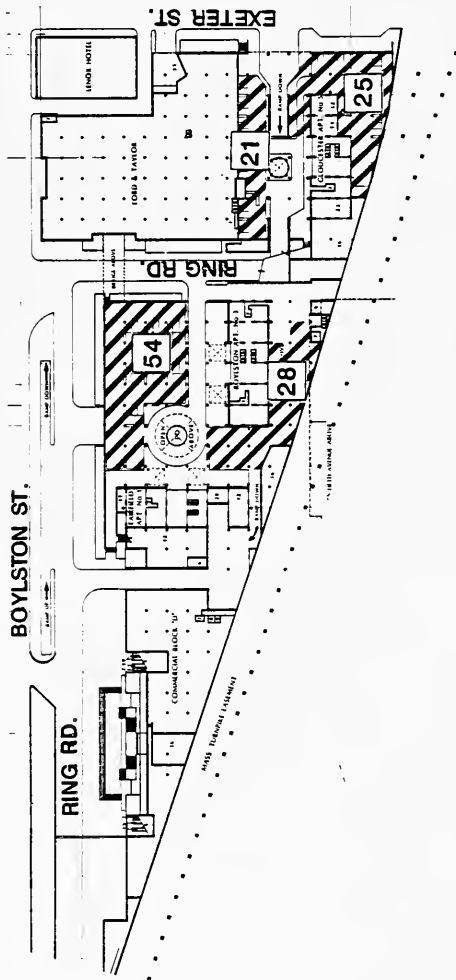
Fig. III-8 A Parking Layout North Garage Mezzanine Level

LEGEND:

- 8 No. of Spaces
- Reserved
- Public Long Term
- Public Short Term

0 200 400
Scale : feet

Total Spaces = 128



Redevelopment

Street Level

Public Short Term







0 200 400
Scale : feet



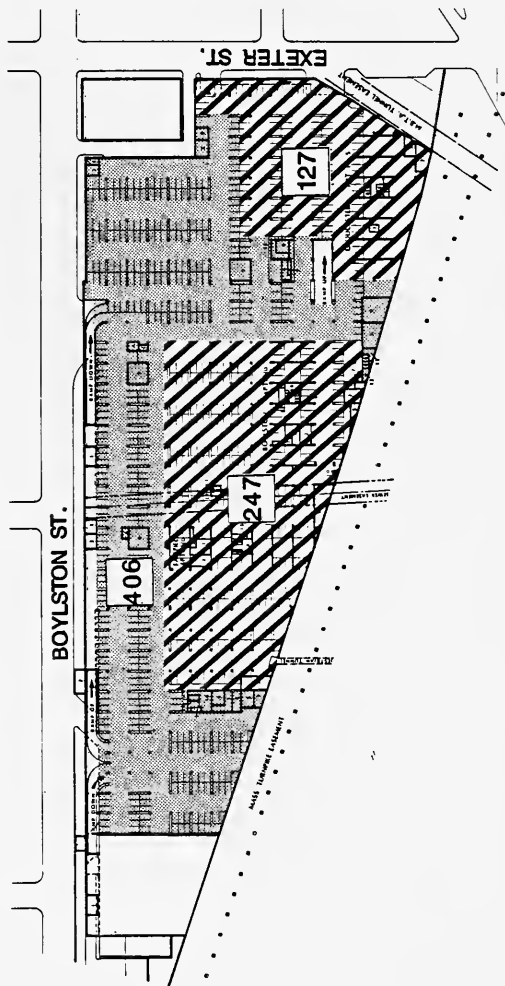
Prudential Center Redevelopment

Fig. III-8C
Parking Layout
North Garage
Lower Level

LEGEND:

-  No. of Spaces
-  Reserved
-  Public Long Term
-  Public Short Term

0 200 400
Scale: feet



Total Spaces = 780

Redevelopment

Mezzanine Level

LEGEND:

- Public Short Term



Total Spaces = 335

Prudential Center Redevelopment

Fig. III-9B

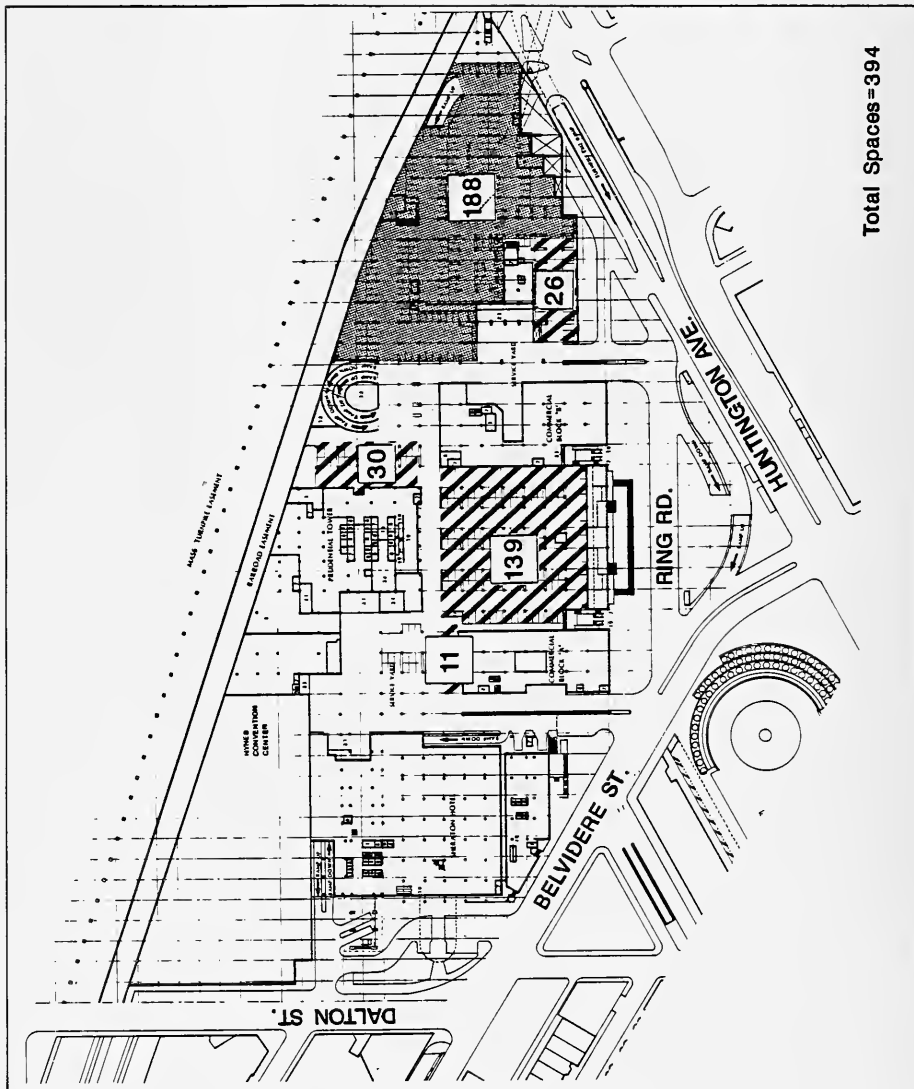
Parking Layout South Garage Street Level

LEGEND:

- 8 No. of Spaces
- Reserved
- Public Long Term
- Public Short Term

0 200 400
Scale : feet





Total Spaces = 394



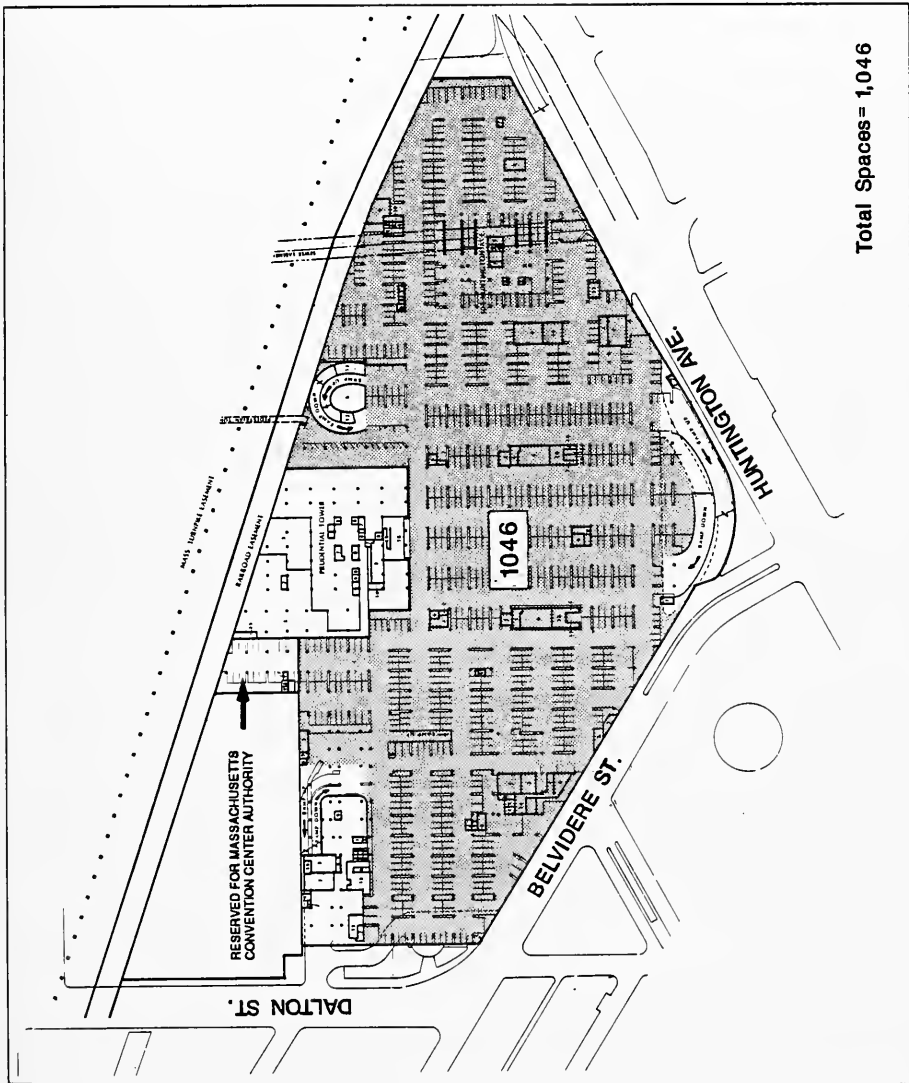
Prudential Center Redevelopment

**Fig. III-9C
Parking Layout
South Garage
Lower Level**

LEGEND:

- | | |
|---|-------------------|
|  | No. of Spaces |
|  | Reserved |
|  | Public Long Term |
|  | Public Short Term |

0 200 400
Scale - feet



Total Spaces = 1,046

The majority of spaces in the garage (2,320 or 77 percent) are open to the public. The public spaces are divided between those that are available all day to commuters, visitors, hotel guests, and shoppers, and those spaces that are not available until after 9:30 AM. Those available after 9:30 AM are primarily used by visitors and shoppers. A total of 1,787 spaces are available all day and an additional 533 spaces are available after 9:30 AM. Those spaces available after 9:30 AM are located on the street level, with 188 spaces in the South Garage and 345 spaces in the North Garage. There are 1,381 spaces available all day on the mezzanine and lower levels of the South Garage, and 406 spaces on the lower level of the North Garage. Included in the all-day spaces in the South Garage are 286 spaces designated for the Sheraton Hotel.

Current Use

Parking accumulation and gate volume information for the Prudential Center Garage were obtained from reports generated by the computerized revenue control system for the period of November 19, 1987 to July 25, 1988. The database was analyzed to determine current garage use by user group and area of the garage (North/South).

A total of 134 non-holiday weekdays were analyzed to determine maximum daily occupancy. Peak hour garage use was found to generally occur between 1:00 PM and 2:00 PM. Table III-13 shows current weekday garage use for the North and South garages by public and reserved areas. Figure III-10 shows current parking use by hour.

Three types of days are summarized in Table III-13--Average Day, 85th Percentile Day, and Hynes Day. On an "Average Day," a total of 2,361 vehicles (78 percent of the garage capacity) were parked during the hour of peak accumulation. Eighty-four percent of public spaces were occupied, while 58 percent of reserved spaces were occupied. The distribution between the two garages was the same for total utilization (78 percent), but varied somewhat between public and reserved spaces.

TABLE III-13
WEEKDAY GARAGE UTILIZATION

Location/Use	Capacity	Average Day		85% Day*		Hynes Day	
		Occupied Spaces	%**	Occupied Spaces	%	Occupied Spaces	%
North Garage:							
Public	751	695	93%	762	102%	847	113%
Reserved	<u>502</u>	<u>285</u>	<u>57%</u>	<u>294</u>	<u>59%</u>	<u>303</u>	<u>60%</u>
TOTAL	1,253	980	78%	1,056	84%	1,150	92%
South Garage:							
Public	1,569	1,254	80%	1,446	92%	1,585	101%
Reserved	<u>206</u>	<u>127</u>	<u>62%</u>	<u>146</u>	<u>71%</u>	<u>139</u>	<u>68%</u>
TOTAL	1,775	1,381	78%	1,592	90%	1,724	97%
Total Garage:							
Public	2,320	1,949	84%	2,208	95%	2,432	105%
Reserved	<u>708</u>	<u>412</u>	<u>58%</u>	<u>440</u>	<u>62%</u>	<u>442</u>	<u>62%</u>
TOTAL	3,028	2,361	78%	2,648	88%	2,874	95%

* 85 percent of all days had a volume equal to or less than the volumes on the 85th percentile day.

** Occupancy in excess of 100 percent occurs when vehicles park in unmarked areas such as travel lanes and aisles.

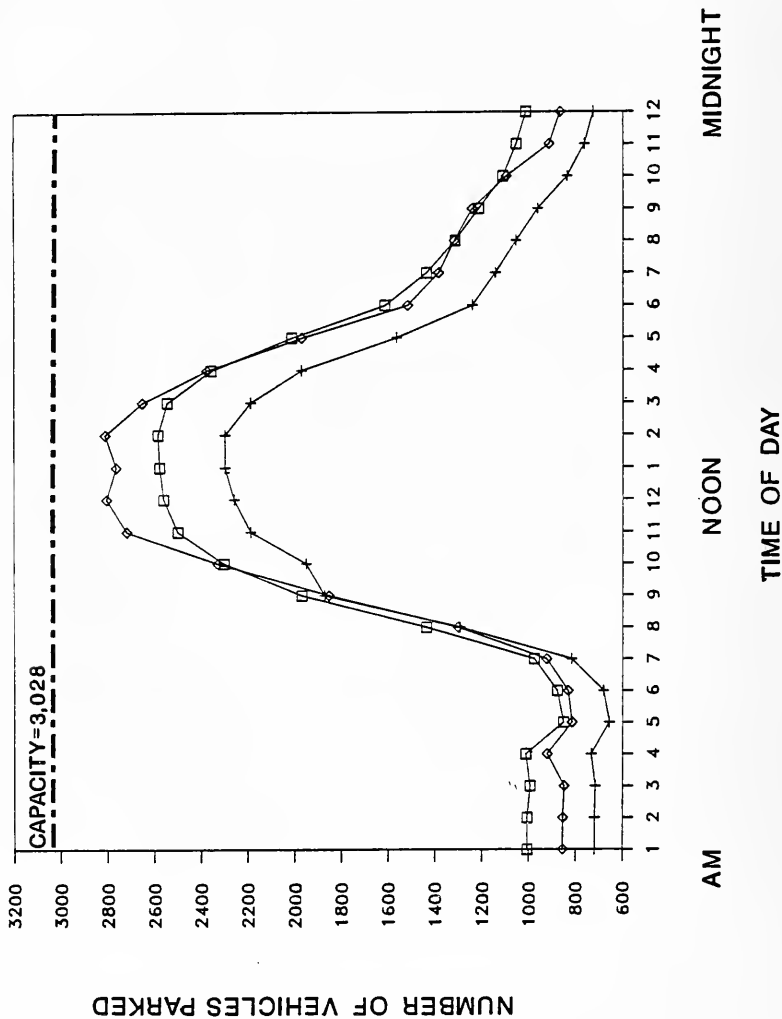
The "85th Percentile Day" is a day on which the volume of cars parked is equal to or greater than the volume parked on 85 percent of all days. This type of day was analyzed because it does not represent maximum utilization, but does represent a situation that will not be exceeded more than 30 times in a year. On the 85th percentile day, overall garage utilization was 88 percent, with 95 percent of the public spaces and 62 percent of the reserved spaces occupied.

Prudential Center Redevelopment

Fig. III-10 Existing Garage Utilization

LEGEND:

- ◇ Hynes Day
Sept. 14, 1988
- Planning Day
(85th Percentile)
March 8, 1988
- + Average Day
Feb. 17, 1988



The "Hynes Day" is one with a major activity at the Hynes Convention Center that generates a significant demand for parking. Major activity usually occurs when either a large regional or local event is in session. A regional Semiconductor Conference drawing approximately 8,000 attendees over a one-week period in September was used for analyzing parking utilization with a major activity at the Hynes Convention Center. Overall garage utilization at peak accumulation was 95 percent on the day of the Hynes event, with utilization of public spaces at 105 percent and utilization of reserved spaces at 62 percent. The public spaces in the Prudential Center Garage were observed to be at capacity for 20 of the 134 weekdays analyzed (about 15 percent). The overcapacity use of public spaces is possible because of the wide aisles and lanes, and other unmarked areas where vehicles can be parked without interfering with garage circulation.

Existing Study Area Parking Conditions

Information on parking availability in the study area was assembled from two sources: Profile of Existing Transportation Conditions in the Back Bay, prepared for Prudential Realty Group by HMM Associates, Inc. and Cambridge Systematics, Inc. (September 1987) and Parking in Central Boston: Meeting the Access Needs of a Growing Downtown, prepared by Cambridge Systematics, Inc. and Vanasse Hangen Associates (December 1983).

Off-Street Parking

Capacity and utilization of the public and private garages in the study area are given in Table III-14. The study area contains a total of 5,277 off-street parking spaces of which 2,343 parking spaces are available for general public use. The remaining 2,934 spaces are reserved for private use (e.g., residents, employees, hotel guests). Parking is in high demand in the study area. Total utilization for noontime parking is approximately 4,374 spaces, or 83 percent of capacity.

TABLE III-14
OFF-STREET PARKING CAPACITY AND UTILIZATION

<u>Facility</u>	<u>Capacity</u>	<u>Noontime Accumulation Occupied Spaces</u>	<u>Percent*</u>
<u>Public:</u>			
Blagden	60	65	108%
Newbury	50	60	120
278-84 Dartmouth	71	40	56
Sunoco Station	25	22	88
Danker & Donahue	500	263	53
Cheri	501	447	89
Colonnade	275	152	55
Copley Place	<u>860</u>	<u>826</u>	<u>96</u>
Subtotal	2,343	1,875	80%
<u>Private:</u>			
Alley 434	14	11	79%
939 Boylston	22	18	82
Back Bay Hilton	265	161	61
Copley (Westin)	275	126	46
Copley (Back Bay)	554	501	90
101 Belvidere	550	500	91
Midtown Motor Inn	145	92	63
Greenhouse	210	170	81
Follen Street	20	22	110
Garrison Street	28	48	171
Garrison Mall	18	29	161
Copley Place	307	295	96
Christian Science	<u>526</u>	<u>526</u>	<u>100</u>
Subtotal	2,934	2,499	85%
TOTAL	5,279	4,374	83%

* Occupancy in excess of 100 percent occurs when vehicles park in unmarked areas such as travel lanes and aisles.

Source: Parking in Central Boston: Meeting the Access Needs of a Growing Downtown, Cambridge Systematics, Inc. and Vanasse Hangen Associates, (December 1983). Information on the Christian Science Center Garage was acquired from the Physical Plant Manager for the Center.

On-Street Parking

Table III-15 provides an inventory of the legal on-street, non-resident parking spaces in the study area. While there is some available capacity for off-street parking, parking on the street is much more difficult to find. Use of on-street parking at noontime is virtually 100 percent (Profile of Existing Transportation Conditions in the Back Bay, HMM Associates and Cambridge Systematics, Inc., July 1988). Additionally, there are a number of residential on-street parking spaces in the study area. These spaces, however, are not available for non-resident parking.

TABLE III-15
ON-STREET PARKING CAPACITY

<u>Street</u>	<u>No. of Legal Non-Resident Spaces</u>
Newbury Street	314
Boylston Street	224
Hereford Street	73
Gloucester Street	69
Fairfield Street	61
Exeter Street	78
Dartmouth Street	78
Clarendon Street	105
Stuart Street	50
St. James Avenue	17
Dalton Street	0
Belvidere Street	48
Huntington Avenue	53
St. Botolph Street	<u>83</u>
TOTAL	1,251

Source: Parking in Central Boston: Meeting the Access Needs of a Growing Downtown, Cambridge Systematics, Inc. and Vanasse Hangen Associates (December 1983).

2.2.2 Garage Access

The Prudential Center Garage is divided by the Massachusetts Turnpike. As a result, the North Garage and South Garage are independent with no automobile connection between the two. Access to and egress from the garages are via the Ring roads, and Exeter, Dalton, and Belvidere streets, as shown in Figure III-11. A description of each of the entrances and exits is provided in Table III-16. Three access points built when the Prudential Center was constructed --ramps on North Ring Road, Belvidere Street, and South Ring Road (Locations 1, 10, and 11 on Figure III-11)-- have been permanently closed.

Figure III-11 shows parking access for both the North and South garages. For the North Garage, access is provided along North Ring Road, East Ring Road, and Exeter Street. One entrance and one exit (ramps 3 and 2, respectively) are provided for lower-level use along North Ring Road. Additionally, an entrance and exit (4) are provided for cars using street-level parking. All vehicles using the North Ring Road access must enter from Boylston Street and exit at the North Ring Road and East Ring Road intersection. Two entrances/exits are provided on East Ring Road for mezzanine-level parking and drop-offs for either the Boylston and Fairfield (5) or Gloucester (8) residential towers. An entrance/exit (7) is provided for street- and lower-level parking on Exeter Street.

There are four access locations for the South Garage:

- o On South Ring Road at East Ring Road, exit 8 serves cars parked on the mezzanine- and street-level in the evening peak period only.
- o Just west of the Turnpike off-ramps, an entrance for cars on South Ring Road provides direct access to the street level. Both lower-level and mezzanine-level parking access is also provided from this location via internal ramps.

Prudential Center Redevelopment

Fig. III-11
Site
Access/Egress

LEGEND:

↑ CARS ONLY

↗ TRUCKS ONLY

↖ CARS
AND TRUCKS

0 200 400
Scale: feet

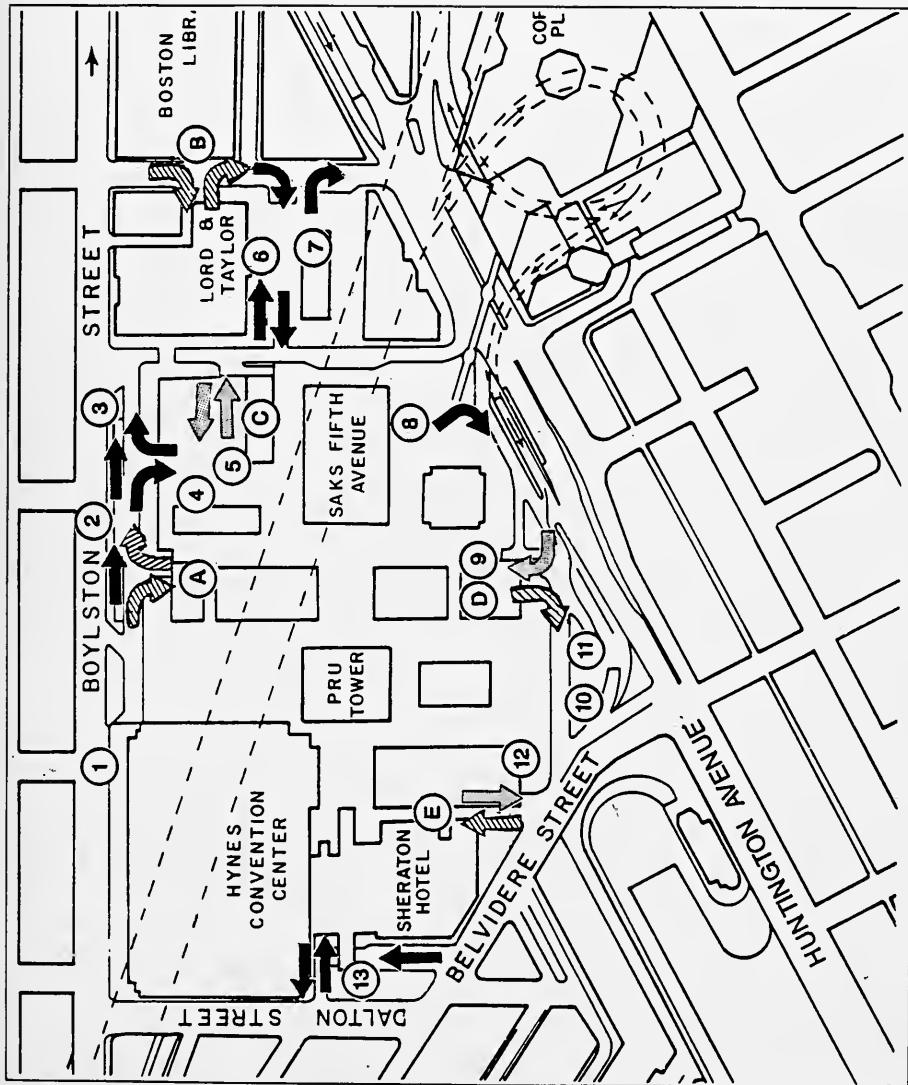


TABLE III-16
GARAGE AND LOADING DOCK ACCESS/EGRESS

Location Number	Entry/Exit	Operating Hours	Description	Type of Control Ticket/Card	Comments
<u>Automobile Access</u>					
1	Closed				Permanently closed for Hynes expansion.
2	Exit	24 Hours	Single-lane exit from lower-level residential and public parking to North Ring Road.	Both	Residential areas are fenced with access controlled by an additional gate, which is card-activated.
3	Entry	24 Hours	Single-lane entry from North Ring Road to lower level.	Both	
4	Entry/Exit	10:00 AM to 7:00 PM	Two-lane entry and exit from North Ring Road to street-level public parking.	Both	
5	Entry/Exit	24 Hours	Two-lane entry and exit from East Ring Road to Boylston/Fairfield residential drop-off and mezzanine-level residential parking.	Card	Boylston/Fairfield residential parking has assigned spaces. Common ramp for 5 and 6.
6	Entry/Exit	24 Hours	Two-lane entry and exit drive from East Ring Road to Gloucester residential drop-off and mezzanine-level residential parking.	Card	Gloucester residential parking has assigned spaces.
7	Entry/Exit	6:00 AM to 6:00 PM for cash; 6:00 AM to 11:30 PM for cardholders	Two-lane ramp from Exeter St. to street-level public parking and lower-level public and residential parking.	Both	Two entry lanes and two exit lanes merge to a two-lane, two-way ramp.
8	Exit	4:00 PM to 6:00 PM weekdays	Single-lane exit from mezzanine-level public parking to South Ring Road.	Both	
9	Entry	24 Hours	Single-lane entry from South Ring Road to street-level public parking. Access to mezzanine- and street-levels provided via internal ramps.	Both	South Ring Road entry. Common entry ramp for 9 and D.

GARAGE AND LOADING DOCK ACCESS/EGRESS

<u>Location Number</u>	<u>Entry/Exit</u>	<u>Operating Hours</u>	<u>Description</u>	<u>Type of Control Ticket/Card</u>	<u>Comments</u>
10	Not Used				Abandoned exit ramp.
11	Not Used				Abandoned entry ramp.
12	Exit	24 Hours	Single-lane exit from Street Level to Belvidere Street. Also serves mezzanine- and street-level parking via internal ramps.	Both	Belvidere exit. Common exit ramp for 12 and E.
13	Entry/Exit	24 Hours	Two-lane entry and exit ramp from Dalton Street to lower-level hotel and public parking.	Both	
<u>Loading Docks</u>					
A	Entry/Exit	24 Hours	Two-lane entry and exit ramp from North Ring Road to loading dock.	None	Star Market/Fairfield Apartment.
B	Entry/Exit	6:00 AM to 4:00 PM	Two-lane entry and exit ramp from Exeter Street to loading dock.	None	Lord & Taylor.
C	Entry/Exit	7:00 AM to 4:00 PM	Two-lane entry and exit ramp from East Ring Road to loading dock.	None	Boylston Apartment Dock. Common ramp for C and 5.
D	Entry/Exit	4:00 AM to 6:00 PM	Two-lane entry and exit ramp from South Ring Road.	None	101 Huntington/Saks/Commercial area common entry ramp for D and 9.
E	Entry/Exit	4:00 AM to 6:00 PM	Two-lane entry and exit ramp from Belvidere Street.	None	Sheraton Hotel/ Prudential Tower Area. Common exit ramp for C and 12.

- o On Belvidere Street, exit (12) provides egress directly from the street level and from the lower and mezzanine levels via internal ramps.
- o On Dalton Street, an exit and entrance (13) provides access to the lower level.

2.2.3 Loading

There are five loading areas at the Prudential Center. These are the Star Market/Fairfield Apartments dock; the Lord & Taylor dock; the Boylston Apartments service area; the Saks Fifth Avenue, 101 Huntington Avenue, and Commercial Block dock area; and the Sheraton Hotel and Prudential Tower dock area. Access to and egress from these five areas are shown on Figure III-11.

To study truck activity at the Prudential Center, a 12-hour survey (6:00 AM to 6:00 PM) was conducted on November 29, 1988 of the three major dock areas: Star Market/Fairfield Apartments; Saks Fifth Avenue, 101 Huntington Avenue, and Commercial Block; and the Sheraton Hotel and Prudential Tower. The Lord & Taylor dock was not surveyed because it serves only Lord & Taylor, and no changes are planned for the dock in the future. The Boylston Apartments service area was not surveyed because it serves only that apartment building and experiences relatively low truck volume. Data were collected for each truck regarding arrival time, departure time, queue length at time of arrival, truck type, and type of delivery. Table III-17 displays the number of trucks by type arriving at each dock during the 12-hour period.

The Prudential Tower and Sheraton Hotel dock area was observed to be the busiest, with queues inside the garage as long as four to five trucks. Truck activity between 6:00 AM and 6:00 PM at the Prudential Center was observed to be spread fairly evenly throughout the day, with no strong peaks. A minor peak was observed between 10:30 AM and 11:30 AM for all dock areas and another minor peak between 1:45 PM and 2:45 PM was observed for the Sheraton Hotel and Prudential Tower dock area.

TABLE III-17
LOADING DOCK UTILIZATION
(6:00 AM to 6:00 PM)

Area Dock	Passenger Car	Van	Type of Vehicle						Other	Total
			Truck	Small (2 Axle)	Large (2 Axle)	Large (3 Axle)	(3 Axle)	Semi-Tractor (4 Axle)	Trailer (5 Axle)	
Star Market	4	8	12	10	0	0	4	0	3	41
Apartment Area*	0	0	0	0	0	0	0	0	0	0
Sheraton Hotel/ Prudential Tower	20	44	37	38	3	3	4	2	0	148
Commercial Block 20	11	14	7	10	0	0	1	0	0	44
Saks Fifth Avenue/101 Huntington Avenue	20	29	6	20	0	0	0	1	0	76
Total	55	95	62	78	3	3	9	3	3	309

* No truck activity was observed. A few contractor or maintenance cars entered and parked in the area.

2.3 Public Transportation

The project site is well served by public transportation. Figure III-12 shows the existing facilities and services in the area. These include two of the four rapid transit lines operated by the Massachusetts Bay Transportation Authority (MBTA), commuter rail, and local and express bus routes.

2.3.1 Rapid Transit

Three Green Line stations and one Orange Line station are located within one-quarter mile of the project site. The Orange Line, accessible at Back Bay Station, runs north through downtown Boston and Charlestown to the northern suburbs, and south through Roxbury to Jamaica Plain.

The Green Line consists of four branches, all of which may be accessed at Copley station, within one-quarter mile of the project site. In addition, the Boston College (B), Cleveland Circle (C), and Riverside (D) branches can be accessed at the Auditorium station, the main entrance of which is located approximately 1,000 feet from the Prudential Center on Massachusetts Avenue. (A secondary entrance to the Auditorium station, not currently in use, is located on Boylston Street, approximately 500 feet from the Center.) The Arborway (E) branch can be accessed at the Prudential Center station, located adjacent to the project site.





The Red and Blue lines can be accessed via transfer from either the Green or Orange lines. Transfer points to the Red Line occur at Park Street from the Green Line, or at Downtown Crossing from the Orange Line. The Red Line runs northwest to Cambridge and south to Dorchester and Braintree. The Blue Line, which runs northeast through East Boston to Revere, can be accessed via a transfer from the Green Line at Government Center or from the Orange Line at State Street.

Prudential Center Redevelopment

Fig. III-12 Location of Public Transportation

Note: Two-Way
Directional Arrows
Unmarked

LEGEND:

-  Bus Route
-  Bus Route No.
-  MBTA Station
-  Closed

0 200 400
Scale: feet

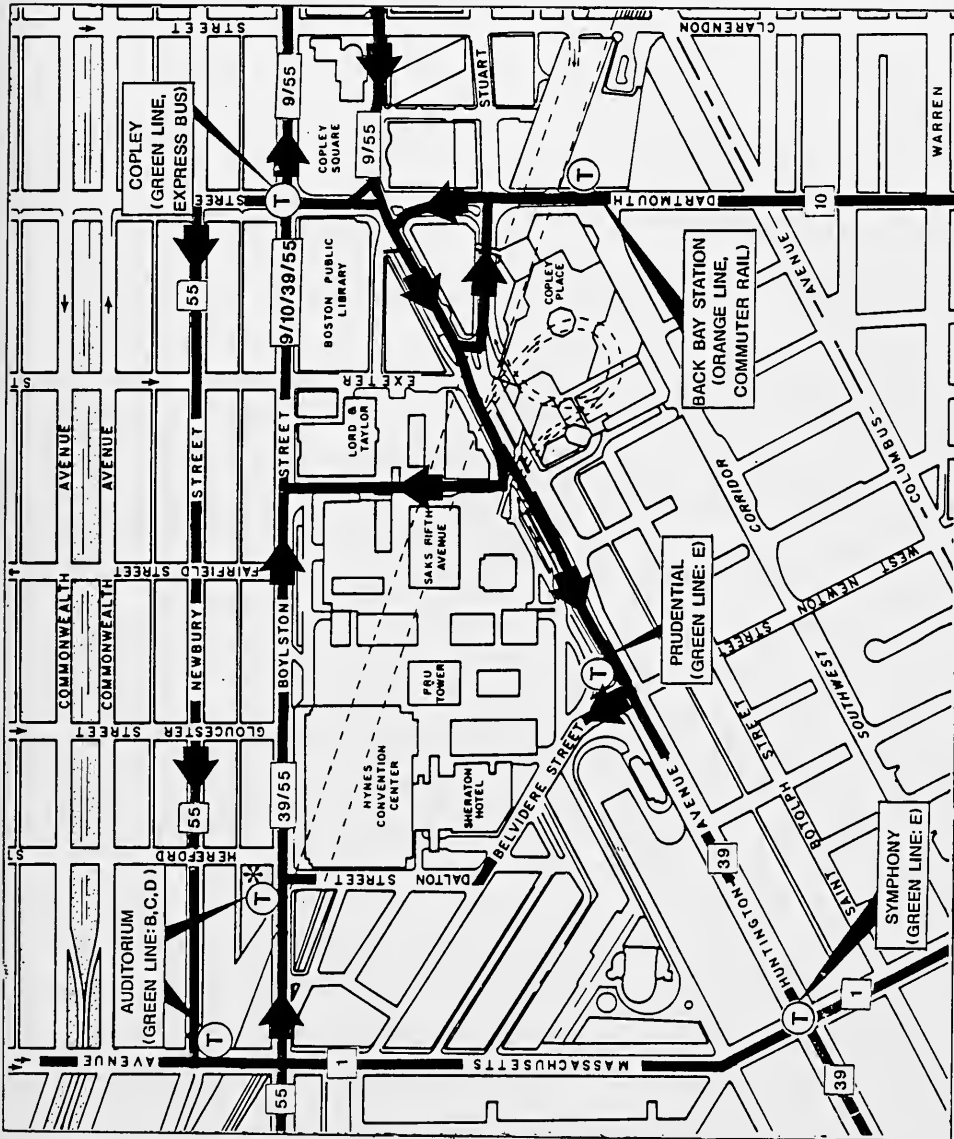


Table III-18 shows the service frequency and capacity of each rapid transit line for peak direction in the evening peak hour. Line capacities are calculated from the car capacities used by the MBTA for planning purposes, although heavier passenger loads are often observed on the system. The table shows that the transit lines in the study area can accommodate the following peak hour loads:

- o Orange Line - 12,100 passengers in each direction
- o Green Line/West - 10,000 passengers; Green Line/North - 1,950 passengers
- o Red Line - 13,700 passengers northbound and 17,000 passengers southbound
- o Blue Line - 8,350 passengers

Analysis of a rapid transit line necessarily focuses on the segment with the highest ridership. The service demand in the heavier ("peak") direction on that peak load segment must be closely monitored and periodically forecasted. This is because demand directly influences the amount of service required and, hence, the operating cost and the size of the vehicle fleet. Passenger trips that do not pass through a peak load segment in the peak direction are of little concern because they generally influence neither the service plan nor the budget.

To set a foundation for analysis of the impacts of the Prudential Center Redevelopment on the MBTA rapid transit system, it is necessary to compare peak hour, peak direction ridership with capacity at the system's seven peak load points. The transit analysis locations, unlike signalized intersection analysis locations, do not depend on the site of the proposed project. When transit impacts occur, they occur on these critical segments, regardless of their distance from the project site.

TABLE III-18
EXISTING RAPID TRANSIT LINE CAPACITY
EVENING PEAK HOUR, PEAK DIRECTION*

<u>Line/Segment</u>	<u>Average Cars/ Train</u>	<u>Average Headway (minutes)</u>	<u>Average No. of Trains</u>	<u>Planning Capacity of Car**</u>	<u>Planning Capacity of Line</u>
<u>Red Line/North</u> Ashmont-Alewife Braintree-Alewife	5.08	4.00	15.0	180	13,700
<u>Red Line/South</u> Alewife-Ashmont Alewife-Braintree	5.23	3.33	18.0***	180	17,000
<u>Green Line/West</u> Boston College Cleveland Circle Riverside Huntington Ave.	1.69	1.32	45.5	130	10,000
<u>Green Line/North</u> Lechmere Service	2.00	8.00	7.5	130	1,950
<u>Orange Line/</u> <u>North-South</u> Oak Grove- Forest Hills	5.57	4.29	14.0	155	12,100
<u>Blue Line</u> Bowdoin- Wonderland	4.00	3.16	19.0	110	8,350

* Green Line/West and Orange Line data are based on observed system performance in the fall of 1988. All other information is from fall 1988 schedules obtained from the MBTA.

** The MBTA uses these capacity estimates for planning purposes. Heavier loads can be carried and are often observed on the system.

*** Includes three additional six-car Braintree trains during the peak hour.

The MBTA periodically counts in-vehicle passengers at certain peak load segments. On the Orange Line, for example, the peak load segments are Haymarket-North Station and New England Medical Center-Back Bay Station. On the Green Line, the peak load segments are

Arlington-Copley and Science Park-Lechmere. Table III-19 compares current ridership with current capacity. At all peak load segments on the system, evening peak hour ridership is within planning capacity.

TABLE III-19
EXISTING RAPID TRANSIT CAPACITY AND RIDERSHIP
EVENING PEAK HOUR OUTBOUND

<u>Line/Direction</u> <u>(Peak Load Segment)</u>	<u>Planning</u> <u>Capacity</u> <u>of Line*</u>	<u>Ridership</u> <u>at Peak</u> <u>Load Segment**</u>	<u>Ridership</u> <u>as Percent</u> <u>of Capacity</u>
Red Line/North (Kendall-Central)	13,700	8,100	59%
Red Line/South (Broadway-Andrew)	17,000	12,750	75%
Green Line/West (Arlington-Copley)	10,000	8,900	89%
Green Line/North (Science Park-Lechmere)	1,950	1,250	64%
Orange Line/North (Haymarket-North Station)	12,100	8,900	74%
Orange Line/South (N.E. Medical Center Back Bay Station)	12,100	7,650	63%
Blue Line/North (Aquarium-Maverick)	8,350	6,250	75%

* Green Line/West and Orange Line data are based on observed system performance in the fall of 1988. All other information is from fall 1988 schedules obtained from the MBTA.

** Orange Line/South and Green Line/West ridership figures are taken from independent observations by Vanasse Hangen Brustlin, Inc. during the fall of 1988. Red Line/North and Green Line/North riders are estimated from 1986 and 1984 counts, respectively; other ridership data are from the spring of 1988 MBTA counts.

It should be noted that neither service demand nor service delivery occurs uniformly over the peak hour, instead, there may be surges in demand or gaps in service. In such cases, trains become overcrowded and some passengers are forced to wait for another train.

Another factor that affects the capacity of the system is equipment reliability. The Green Line has very often suffered from equipment malfunctions over the past several years. Such malfunctions disrupt the schedule of service and reduce system throughput. The result is a lower effective capacity than would be available under operations not suffering such disruptions.

Observations of Green Line and Orange Line ridership during the evening peak period were conducted at the peak load segments (outbound at Arlington and New England Medical Center Stations, respectively) between September 16 and October 4, 1988. For this reason, the Green Line and Orange Line capacities shown in Tables III-18 and III-19 are based not on MBTA schedules, but on actual system performance observed in the fall of 1988.

Table III-20 compares observations of 1988 Green Line evening peak hour service and ridership with observations conducted in 1986. The data show that the planning capacity of the line has increased due to shorter headways and an increase in the average number of cars per train during the peak hour. During this same period, ridership has decreased from 10,000 to 8,900 passengers, resulting in current ridership levels at 89 percent of capacity versus 133 percent of capacity in 1986.

The main reason for the marked improvement in Green Line capacity between 1986 and 1988 is the purchase of 100 new streetcars manufactured by Kinki of Osaka, Japan. The purchase enabled the MBTA to retire defective "light rail vehicles" manufactured by Boeing in Philadelphia, Pennsylvania and still expand the active fleet. Besides being more reliable, the Japanese cars also provide a smoother ride and feature a more satisfactory air-conditioning system.

TABLE III-20
GREEN LINE SERVICE AND RIDERSHIP
EVENING PEAK HOUR OUTBOUND
DEPARTING FROM ARLINGTON STATION

	<u>Time Period Observed</u>	
	<u>1986*</u>	<u>1988**</u>
Average Headway (Seconds)	100	79
Average Number of Trains	36.0	45.5
Average Train Length	1.60	1.69
Average Number of Cars	57.6	77.0
Planning Capacity of Line	7,500	10,000
Average Number of Riders	10,000	8,900
Riders/Capacity	133%	89%

* Observed between September 22 and October 2.

** Observed September 16 and October 4.

The 11 percent drop in evening peak hour, outbound Green Line/West ridership between 1986 and 1988 is attributed to the opening of the new southwest corridor Orange Line in May 1987. Passengers traveling to Back Bay from downtown Boston during that hour now have two options and many, understandably, prefer the new Orange Line to the older Green Line.

2.3.2 Commuter Rail

The MBTA's commuter rail trains operate from North Station and South Station. The system is comprised of several branches, five of which (Framingham, Needham, Franklin, Providence, and Stoughton) serve Back Bay Station.

Existing, evening peak hour, outbound seating capacity on the commuter rail lines serving Back Bay Station is approximately 7,000, as shown in Table III-21. Evening peak hour outbound ridership (fall 1988) is estimated by the MBTA at 8,600 passengers. This figure is greater than

seating capacity because it includes both seated and standing passengers. The MBTA is continuing to acquire new coaches to serve its expanding ridership.

TABLE III-21
COMMUTER RAIL AT BACK BAY STATION
EVENING PEAK HOUR OUTBOUND*

<u>Line</u>	<u>Total Trains</u>	<u>Total Coaches</u>	<u>Seating Capacity**</u>
Framingham	2	11	1,155
Needham	2	9	945
Franklin	3	21	2,205
Attleboro	2	15	1,575
Stoughton	<u>2</u>	<u>11</u>	<u>1,155</u>
TOTAL	11	67	7,035

* Boston 4:45 and 5:45 PM.

** Based on an average 105 seats per coach.

2.3.3 Public and Private Bus Service

The MBTA currently operates the following seven bus routes that directly serve the Prudential Center:

- o Route 1 (Harvard Square - Dudley Square)
- o Route 9 (City Point - Copley Square via Broadway Station)
- o Route 10 (City Point - Copley Square via Andrew Station)
- o Route 39 (Arborway - Copley Square)
- o Route 55 (Queensberry Street - Park Street)
- o Express bus Routes 302 (Watertown Square - Copley Square)
- o 352 (Burlington - Copley Square)

The typical bus-in service has a seating capacity of 46 passengers. Its normal carrying capacity (used for service planning) is 60 passengers, although greater loads can be accommodated under crush conditions. Based on the scheduled headways and normal capacities, more than 3,100 passengers can be accommodated on MBTA buses leaving the project area during the evening peak hour. Table III-22 shows the bus routes, headways, and planning capacity.

TABLE III-22
MBTA BUS ROUTES SERVING PRUDENTIAL
EVENING PEAK HOUR

<u>Route</u>	<u>Destination</u>	<u>Headway*</u> <u>(Minutes)</u>	<u>Planning</u> <u>Capacity**</u>
1	Dudley	6	600
1	Harvard	6	600
9	City Point	9	400
10	City Point	25	144
39***	Forest Hills	4	900
55	Queensberry Street	30	120
302	Watertown Express	12	300
352	Burlington Express	1 trip	<u>60</u>
TOTAL			3,124

* Spring 1988 schedule.

** Planning capacity is 60 passengers per bus trip.

*** Route 39 is the temporary replacement for the Arborway streetcar service.

Currently, six private bus carriers--Big W, Hub Bus, Marathon Line, Peter Pan, Priority Express, and Yankee Line--stop at Copley Square. In most cases, these private bus lines make only one trip in each peak period.

2.3.4 Existing Problem Areas

In addition to the data collection effort and analysis of peak load segment ridership and capacity, observations were made at rapid transit stations in the project vicinity during the morning and evening peak periods. In general, operations were good; however, some deficiencies were noted. These deficiencies were related to the service, the stations, and the paths to the stations from the project site.

Service

On the Green Line, uneven passenger loads remain a problem. The primary cause appears to be that the available streetcars are broken into too many trains. This causes traffic congestion in the subway and overcrowding of the one-car trains.

On the Orange Line, passenger loads also vary significantly between successive trains. Again, the problem is that some trains are too short. The MBTA has enough Orange Line cars to run 78 cars per hour through the Back Bay Station in each direction. These cars could be grouped into thirteen six-car trains per hour, with an average headway of 4.6 minutes. The MBTA, however, operates fourteen to fifteen trains in each peak hour, using a mix of four-car and six-car trains to maintain a marginally shorter average headway of 4.0 to 4.3 minutes.

The resulting problems are most evident in the morning. A large number of passengers arrive on eight-car commuter rail trains and transfer to the Orange Line at the Back Bay Station, however, they cannot be accommodated by four-car Orange Line trains. On the morning of October 6, 1988, inbound peak hour passenger volume (8,600 passengers) on the Back Bay Station-New England Medical Center peak load segment was only at 77 percent of planning capacity. Nevertheless, about 90 (3 percent) of the estimated 3,000 passengers boarding inbound Orange Line trains at the Back Bay Station had to wait for a second train. Passengers were left behind by two of the three four-car trains, but only one of the ten six-car trains. Consistent use of six-car trains would alleviate this problem.

Stations

On the Green Line, the Boylston Street entrance to the Auditorium station has been closed indefinitely, making the station inconvenient for many passengers. Once a full-service entrance, it was converted to an exit only to eliminate the cost of an attendant. When it became difficult to ensure passenger safety in the isolated corridor connecting the Boylston Street entrance with the platform, the hours of operation were cut back to peak periods. Finally, the exit was closed after a widely publicized assault in 1987.

An ongoing vent shaft construction project precludes reopening the Boylston Street entrance at this time. When that project is completed in 1990, however, the entrance could be reopened. The MBTA has recently had favorable experience with the use of closed-circuit television cameras to ensure passenger safety. This equipment would allow the Boylston Street entrance to be reopened, at least as an exit. The MBTA has also had satisfactory experience with floor-to-ceiling turnstiles known as "iron maidens," which can be activated by tokens and magnetic pass readers. Such a turnstile would allow the Boylston Street entrance to operate without an attendant, addressing the station access deficiency for most passengers (i.e., those with tokens or passes).

At the Back Bay Station, the principal deficiency relates to the Copley Place entrance, which is the one closest to the project site. The entrance is a pedestrian passageway under Dartmouth Street, between the inbound and outbound Orange Line tracks, approximately at the level of the platform. Due to poor design and signage, this entrance is not fully used. The design requires all passengers to climb at least one flight of stairs (no escalator is provided). Although passengers can see the Orange Line platform from the pedestrian passageway, they cannot access it directly because the floor-to-ceiling turnstiles, which block the way, are equipped for exiting passengers only and, thus, do not accept tokens or passes. The use of iron maiden turnstiles, like those used by the MBTA at Downtown Crossing and at Central, would eliminate this deficiency.

The following signage deficiencies were also noted at Back Bay Station:

- o The sign for the Copley Place exit is not visible from the Orange Line platform. Most signs on the platform direct all passengers up to street level even though passengers destined for Copley Place could stay at the lower level until they have crossed under Dartmouth Street.
- o At Copley Place, the subway entrance is poorly marked. As one descends the escalator to the street level from the shopping mall, there is no clear signage directing transit passengers to the stairs and tunnel leading under Dartmouth Street to Back Bay Station.
- o Signs and announcements are needed to advise passengers to spread out along the platform. The vast majority of passengers now cluster at one end of the station's platform (particularly in the morning peak hour). Proper signage and announcements would alleviate the problem of some cars on a train being overcrowded, while other cars on the same train have empty seats.

Paths

Passengers traveling to Back Bay Station during the evening peak hour encounter other deficiencies, based on observations made on September 27, 1988. The revolving door at each end of the Huntington Avenue footbridge appears to be inadequate for the peak evening volumes. Queues form, causing people to use the doors marked "HANDICAP USE ONLY." In addition, the escalator leading down to Dartmouth Street from Copley Place is too narrow to carry people two abreast and too slow to accommodate peak demand. The excess demand is diverted to the parallel staircase, where pedestrians walking at a normal pace move more quickly than those on the escalator.

2.4 Pedestrians

The existing sidewalks within and adjacent to the Prudential Center consist of both minor and major pedestrian corridors. Inventories of sidewalk characteristics and pedestrian volumes were compiled as part of the Phase I data collection process. Level-of-service analyses for walkways and crosswalks were conducted at twelve study area locations for morning, midday, and evening peak hours.

2.4.1 Pedestrian Network Description

Pedestrian access to the Prudential Center is currently provided from the east, west, south, and north. From the east, most pedestrians enter from the Copley Place footbridge crossing over Huntington Avenue. Additional access from the east is provided from the walkway just south of the Gloucester Apartments. Pedestrians using either of these access points must maneuver between the 101 Huntington Avenue office building and Saks Fifth Avenue department store to arrive at the Prudential Tower. Often pedestrians walk through the 101 Huntington Avenue building for a more direct route to the Prudential Tower, especially in inclement weather. Also, the direct walkway path from the east is somewhat obstructed by stairs in the East Court, which pedestrians must ascend then descend to reach the Tower.

Pedestrian access from the west is provided via the Sheraton Hotel which abuts Dalton Street and opens on the West Court near the Hynes Convention Center and Prudential Tower.

Pedestrian access from the south is provided by two sets of escalators (two up and two down) that lead to two corridors on either side of the Prudential Tower on South Ring Road. Access is also provided by stairs located between the two sets of escalators. Pedestrians must go up one level via the stairs or escalators to cross the site between Huntington Avenue and Boylston Street or to reach the Tower lobby or shopping areas. Pedestrian access from the south is further impeded by closed garage ramps near the Prudential Green Line MBTA station and South Ring Road.

From the north, pedestrian access is provided by escalators (one up and one down) at North Ring Road. This access leads to the main north/south corridor on the east side of the Tower. Pedestrians crossing North Ring Road have a limited number of crossing points because of a wall between Boylston Street and North Ring Road. The major access to the Prudential Tower is provided by four revolving doors, two on the east side and two on the west side. These revolving doors often create queuing problems during peak periods. This problem is compounded by the fact that the main east/west corridor across the site between the Copley footbridge on the east and the Hynes Convention Center and Sheraton Hotel on the west passes through the Tower lobby.

Corridors and sidewalks in the area that will provide direct access to the site include the following:

- o Boylston Street. A major pedestrian corridor along the north edge of the site connecting Back Bay with downtown Boston. Boylston Street provides direct access to the Hynes Convention Center, the Boston Public Library, and numerous stores, restaurants, and hotels. In addition, the MBTA Green Line Copley Square station is accessed directly from Boylston Street. The Auditorium station is located just off Boylston Street on Massachusetts Avenue, however, a direct entrance to the station on Boylston Street has been closed. Sidewalks on both sides of Boylston Street are fairly wide (ranging from 10-feet to over 30-feet in some sections).
- o Huntington Avenue. This major pedestrian corridor along the south edge of the site providing access from hotels on Huntington Avenue to the Prudential Center. Huntington Avenue is a divided roadway in the vicinity of the site with sidewalks at least 10-feet wide on both sides. The MBTA Prudential Green Line stop is located on Huntington Avenue at Belvidere Street.
- o Belvidere Street. A major pedestrian corridor connecting Huntington Avenue with Dalton Street and providing direct access to the Sheraton Hotel and the Christian Science Church. Sidewalks on both sides of Belvidere Street are generally 8-feet wide.

- o Dalton Street. A pedestrian corridor connecting Boylston Street with Belvidere Street and providing direct access to the Hynes Convention Center, the Sheraton and Hilton hotels, and the USA Cheri movie theatre. Sidewalks on both side of Dalton Street range from 6- to 14-feet wide.
- o South Ring Road. A major pedestrian corridor connecting East Ring Road and Huntington Avenue with Belvidere Street. The Massachusetts Turnpike exit ramp also feeds into South Ring Road. South Ring Road provides direct access to the Prudential Center. Wide sidewalks are provided on each side of South Ring Road, ranging from 15- to 27-feet wide.
- o East Ring Road. A pedestrian corridor that connects Boylston Street with Huntington Avenue, East Ring Road provides direct access to the Prudential Center, the Fairfield, Boylston, and Gloucester apartments, and the Lord & Taylor and Saks department stores. Sidewalks are generally 8-feet wide on both sides. On the west side near the Boylston Apartments' loading dock and near Huntington Avenue, however, the sidewalk is only 2-feet wide. A major goal of East Ring Road improvements is to provide a wider and safer sidewalk on the west side.
- o Copley Place Footbridge. A major elevated pedestrian corridor over Huntington Avenue connecting the Prudential Center with the Marriott Hotel Lobby at Copley Place and providing access to Back Bay Station. The footbridge is 10-feet wide, is climate controlled, and has handrailings. Access at either end of the footbridge is controlled by revolving doors, which sometimes cause queuing during peak periods.
- o Prudential Corridors. Two major corridors running north/south through the site on either side of the Prudential Tower. Escalator access is provided from Boylston Street on the north and South Ring Road on the south. The corridor is one level above the street and is accessed via stairs or escalators provided on either end.

- o North Ring Road. A major pedestrian corridor parallel to Boylston Street that provides direct access to the Prudential Center. A sidewalk is provided only on the south side and ranges from 30- to 60-feet wide.
- o Exeter Street. A minor pedestrian corridor connecting Boylston Street with Huntington Avenue with limited access provided to the Prudential Center. Sidewalks are generally 8- to 10-feet wide on both sides of Exeter Street.

There are a number of sites within the study area that attract or generate pedestrian traffic including several schools and colleges, churches, auditoriums, hotels, theaters, large office buildings, transit stations, and large retail centers. Some of the specific sites that generate significant pedestrian traffic are shown in Figure III-13.

2.4.2 Pedestrian Volumes

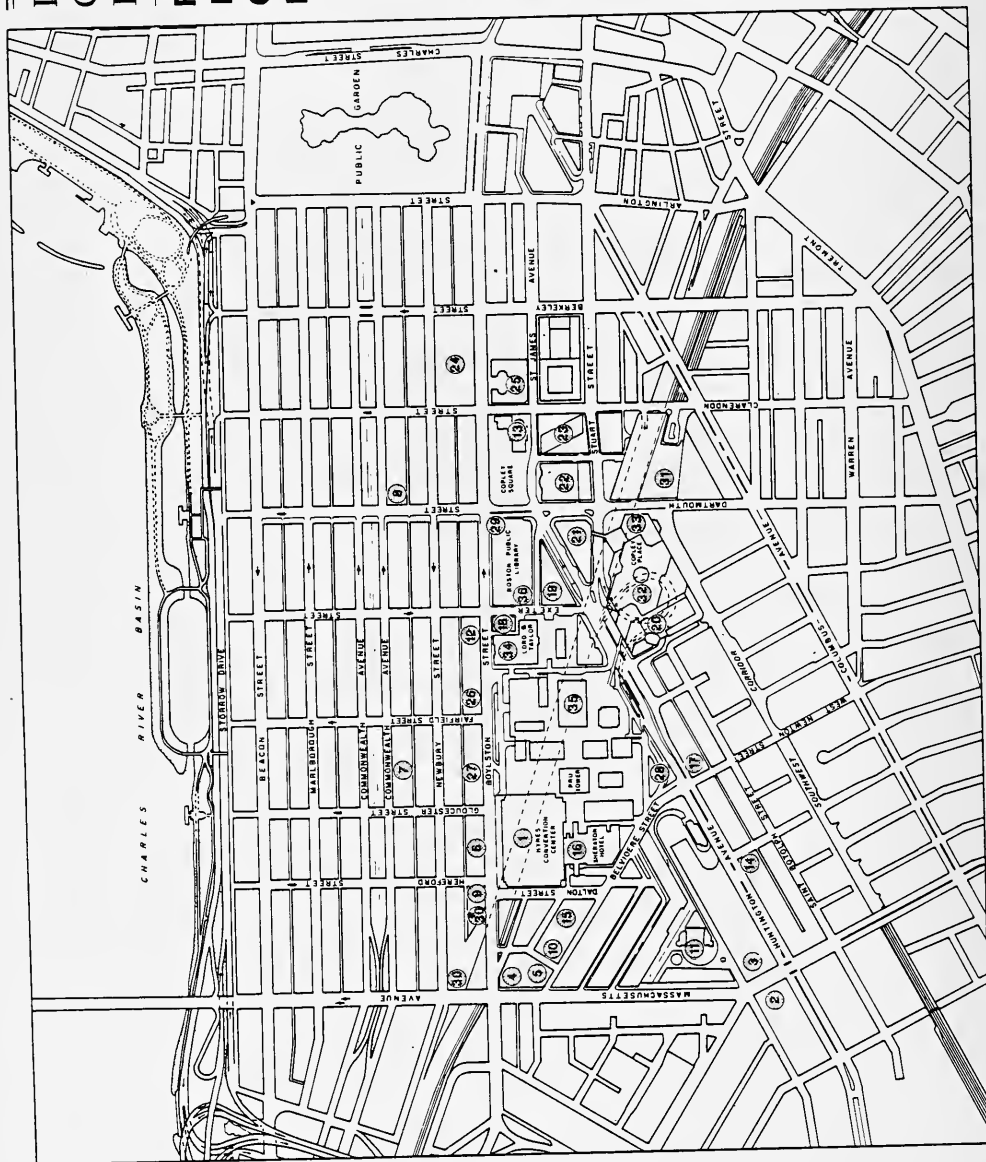
Vanasse Hangen Brustlin, Inc. observed pedestrian volumes in the project area during September, October, and November 1988. These counts were supplemented with pedestrian volumes counted by HMM Associates in May 1987. The counts focused on the level of pedestrian activity at twelve locations identified for analysis in the scoping determination issued by the BRA and MEPA. Counts were taken for the morning, midday, and evening peak periods (7:00 to 9:00 AM, 11:30 AM to 1:30 PM, and 4:00 to 6:00 PM, respectively). In addition to the twelve pedestrian analysis locations identified in the scope, pedestrian counts were conducted at the following three locations within the Prudential Center:

- o Prudential Tower
- o North Ring Road/North Escalator
- o Hynes Convention Center/Sheraton Hotel

Figure III-14 shows the pedestrian analysis locations.

**Fig. III-13
Pedestrian
Generator
Locations**

1. Hyatt Convention Center
2. Symphony Hall
3. Horticultural Hall
4. Berklee Performance Center
5. Berklee College of Music
6. Newbury College of Music
7. Boston College
8. Saint John's College
9. Saint Junior College
10. Institute of Contemporary Art
11. Saint Cecilia Church
12. Christian Science Center
13. Old South Church
14. Trinity Church
15. Trinity Center
16. Back Bay Hilton
17. Sheraton Hotel
18. Hotel Concord
19. Copple Square Hotel
20. Marriott International Hotel
21. Copple Plaza Hotel
22. John Hancock Tower
23. New England Life Insurance
24. 500 Boylston
25. One Essex Plaza
26. 255 State Street
27. 255 Federal Street
28. Green Line Prudential Station
29. Green Line Copple Station
30. Green Line Auditorium Station
31. Green Line Auditorium Station
32. Back Bay Station
33. Copple Plaza
34. North Station
35. North and Taylor
36. State Fifth Avenue
37. Boston Public Library



0 200 400
Scale: feet

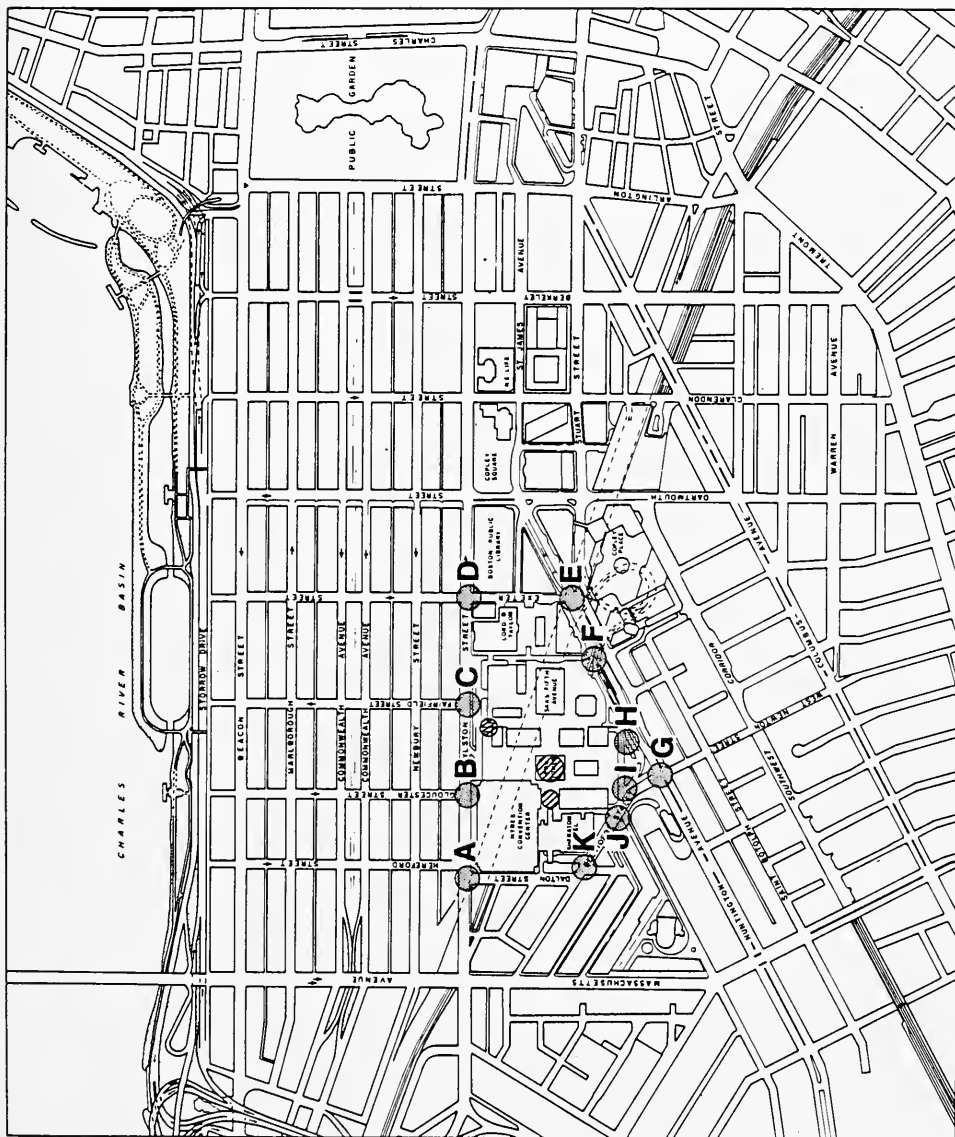
Prudential Center Redevelopment

Fig. III-14 Pedestrian Analysis Locations

LEGEND:

- BRA/MEPA
Analysis
Locations
- ◐ Additional
Analysis
Locations

0 200 400
Scale: feet



Existing morning, midday, and evening peak hour pedestrian volumes are shown in Figures III-15A, III-15B, III-16A, III-16B, III-17A, and III-17B, respectively. The highest pedestrian flow at most locations was observed during the evening peak hour. The morning peak hour pedestrian flow was generally observed to be the lowest. During the morning peak hour, the predominant pedestrian flows were observed to be in the eastbound direction at most study area locations. During the midday peak hour, no predominant pedestrian directional flows were apparent.

On Boylston Street, the majority of pedestrians travel westbound during the evening peak hour, while at most other study area locations south of the site, the predominant pedestrian flow was eastbound. Pedestrians crossing streets at study area locations were observed to travel predominantly towards the Prudential Center during the morning peak hour and away from the Prudential Center during the evening peak hour.

During the morning peak hour, the predominant pedestrian flow is inbound towards the Prudential Center. The escalators at South Ring Road were observed to be the most frequently used pedestrian access corridor inbound in the morning. This entrance accounted for approximately 36 percent of inbound pedestrian volume during the morning peak hour. Inbound pedestrian flow from all other access points was evenly distributed.

In the midday peak hour, inbound and outbound pedestrian flow at the Prudential Center is more or less in balance. The north escalator at North Ring Road receives over 50 percent of the inbound and outbound pedestrian volume at that time, respectively. During the evening peak hour, outbound pedestrian flow accounted for approximately 60 percent of the total pedestrian flow. Again, the escalators at South Ring Road experienced the highest number of pedestrians leaving the Prudential Center during the evening peak hour, approximately 33 percent. Overall, about twice as many pedestrians use the east exit/entrance way of the Prudential Tower than the west access during the morning, midday, and evening peak hours.

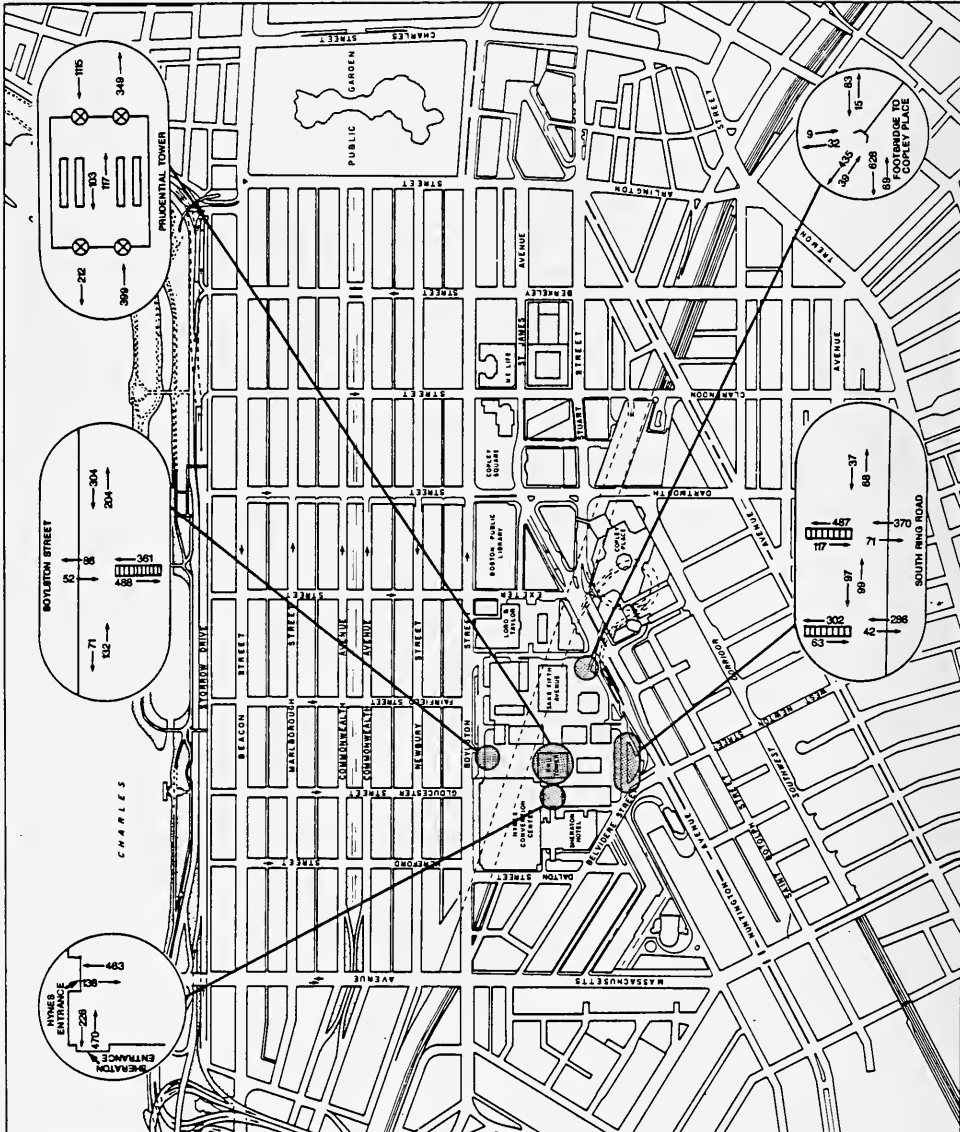
Fig. III-15A
Exsting
AM Peak Ho
Pedestrian
Volumes



Prudential Center Redevelopment

Fig. III-15B Existing AM Peak Hour Pedestrian Volumes

0 200 400
Scale feet



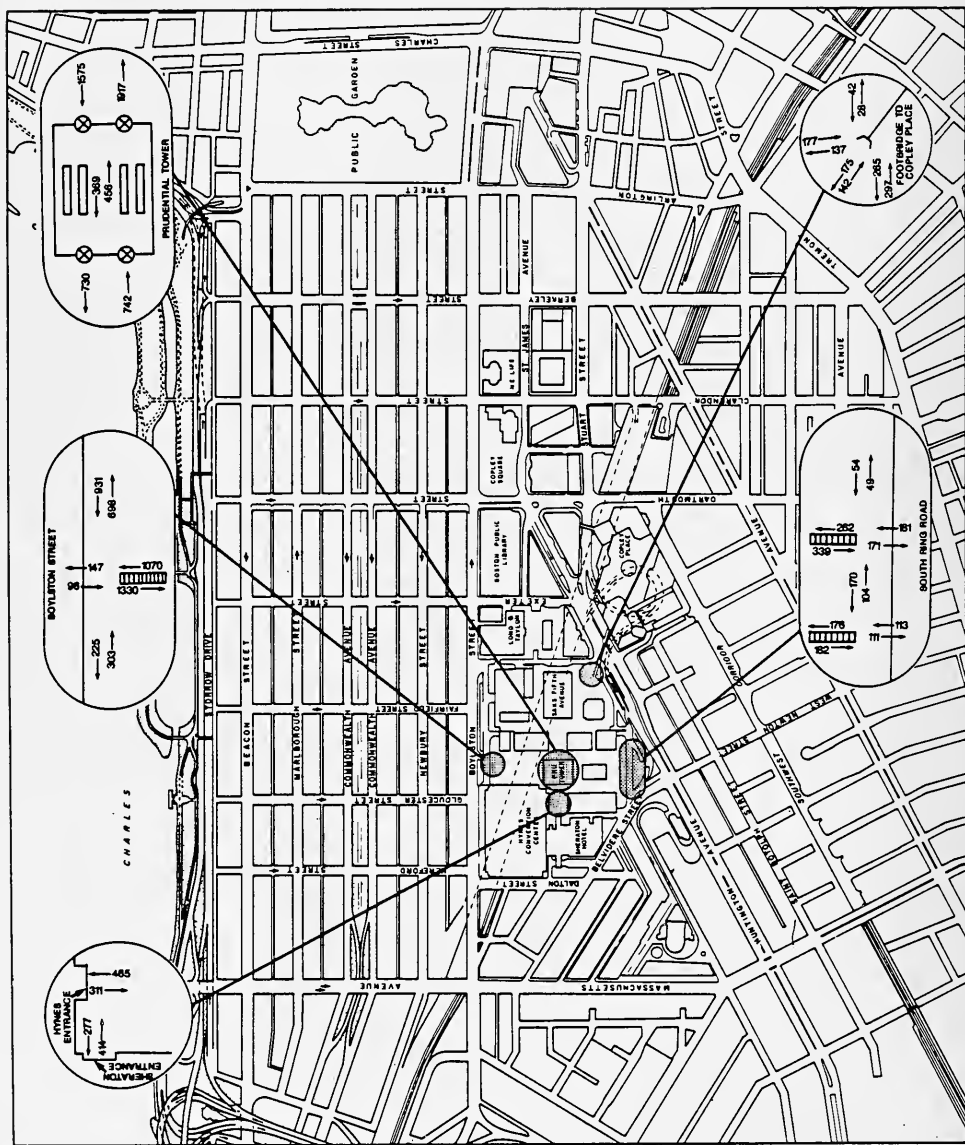
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Prudential Center Redevelopment

Fig. III-16B Existing Midday Peak Hour Pedestrian Volumes



0 200 400
Scale: feet



Prudential
Center
Redevelop

Fig. III-17A
Existing
PM Peak Hour
Pedestrian
Volumes

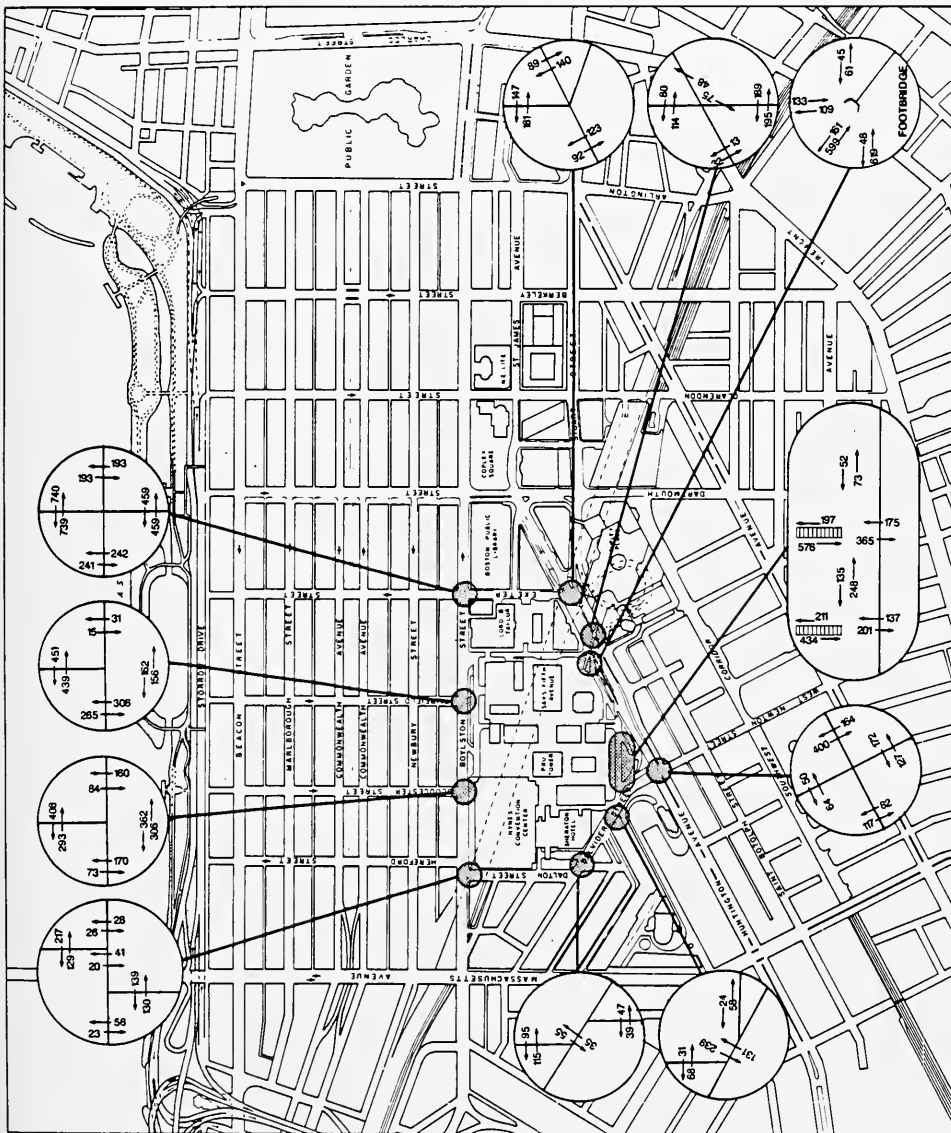
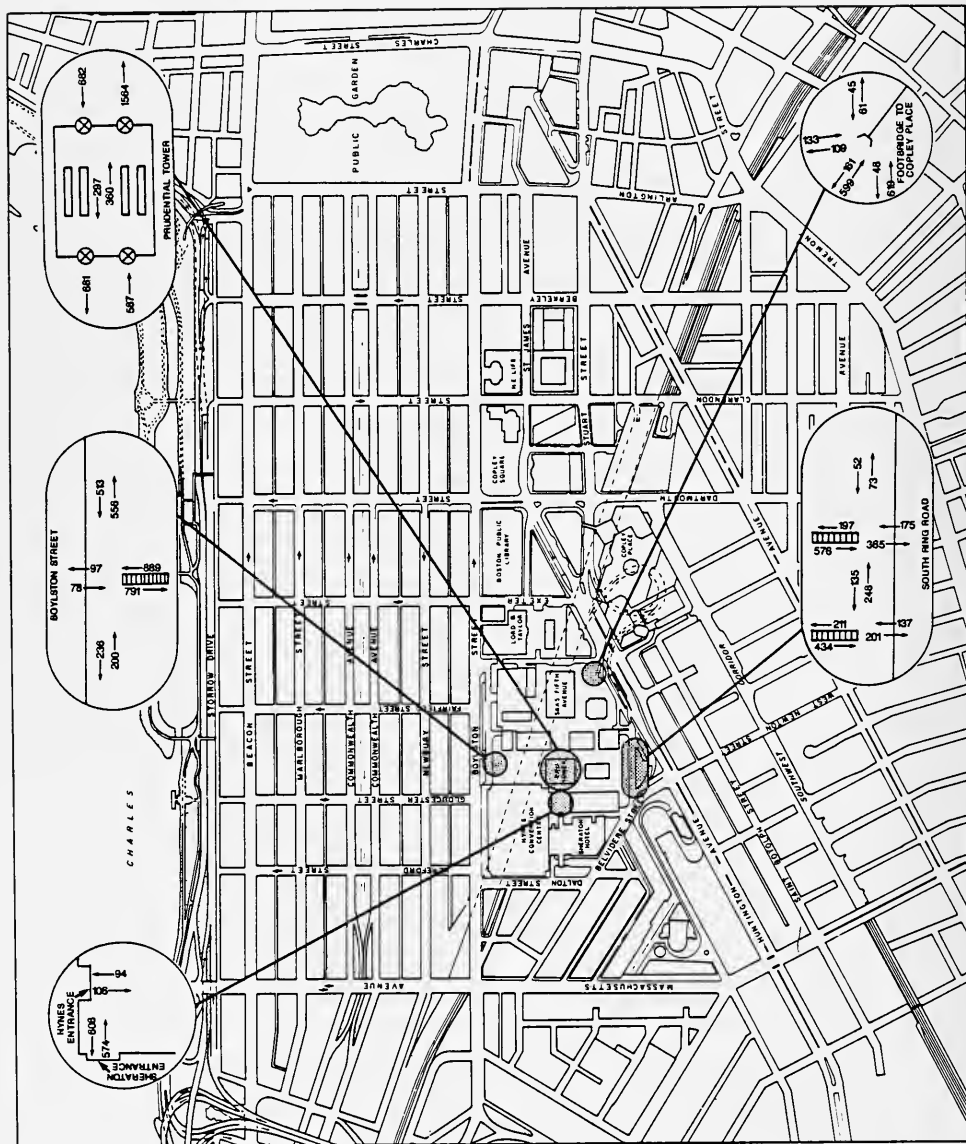


Fig. III-17B
Exsting
PM Peak Hour
Pedestrian
Volumes

0 2(M) 4(M)
Scale feet



2.4.3 Pedestrian Level-of-Service Analysis

Analysis Procedures

The 1985 Highway Capacity Manual, Special Report 209, (published by the Transportation Research Board, National Research Council, Washington, D.C.) also defines a procedure for calculating pedestrian level of service (LOS) based on the relationship of sidewalk space to the volume of pedestrians. A rating system from LOS A to F is provided for walkways and for pedestrian queuing areas. Level-of-service A within a walkway affords pedestrians the opportunity to move in desired paths without altering movements in response to other pedestrians. At LOS B, pedestrians become aware of other pedestrians and may alter their walking paths. At LOS C, sufficient space is available to select normal walking speeds and bypass other pedestrians in primarily one-way streams. At LOS D, the selection of individual walking speeds becomes restricted as does the ability to bypass other pedestrians. LOS E and F are characterized by frequent unavoidable contacts with other pedestrians.

Pedestrian flow is subject to wide variability on a minute-by-minute basis. General flows of pedestrians, as well as the effects of "platooning" of pedestrian flows, must be considered. A platoon is created when pedestrians move together as a group from a stopped position. Pedestrians commonly form platoons while waiting to cross a street at a signalized intersection. Transit facilities can also create added surges in demand by generating large groups of pedestrians in short time intervals, followed by time periods during which little or no flow occurs. Until they disperse, pedestrians in these types of groups move together as a platoon. Platoons can also form if passing is impeded due to insufficient space and faster pedestrians slow down behind slower walkers.

Due to the presence of several transit stations near the project site and the presence of traffic signals at nearby intersections, both the general flow and the platoon effect of pedestrians were analyzed on study area sidewalks. Table III-23 provides a summary of pedestrian level-of-service criteria for walkways. Pedestrian locations are analyzed using 15-minute peak volumes.

TABLE III-23
PEDESTRIAN LEVEL-OF-SERVICE CRITERIA

<u>Level of Service</u>	<u>Space (SF*/Ped)</u>	<u>Expected Flows and Speeds</u>			<u>V/C Ratio**</u>
		<u>Average Speed (Ft/Min)</u>	<u>Flow Rate (Ped/Min/Ft)</u>		
A	>130	>260	< 2		<0.08
B	> 40	>250	< 7		<0.28
C	> 24	>240	<10		<0.40
D	> 15	>225	<15		<0.60
E	> 6	>150	<25		<1.00
F	< 6	<150	-- Variable --		

* Square feet.

** Volume-to-capacity ratio.

Source: The 1985 Highway Capacity Manual, Special Report 209;
Transportation Research Board; Washington, D.C.

Analysis of pedestrian flow characteristics in crosswalks is similar to that used in the walkway analysis. The level-of-service concepts developed primarily for pedestrian movement on walkways were applied to the crosswalk analysis by calculating the average circulation space per pedestrian. Traffic signals and turning vehicles, however, also affect pedestrian flow in crosswalks and were considered in the analysis. Traffic signals alter pedestrian movement on crosswalks by forcing pedestrians into denser platoons, which affects the distribution of normal walking speeds for pedestrians. At locations where turning vehicles were known to conflict with pedestrian movements, an adjustment was made to the LOS to account for this situation. Level-of-service criteria for crosswalks are the same as for walkways.

Along with the average circulation space per pedestrian, a surge condition was analyzed. The surge condition relates to the maximum flow of pedestrians during a walk phase. The surge condition occurs when two lead platoons of pedestrians at opposite corners, cross simultaneously when the walk phase is illuminated. This surge can temporarily force pedestrians out of the crosswalk, closer to traffic flow.

Walkway and Crosswalk Level-of-Service Summary

Using the procedures described above, walkway and crosswalk level-of-service analyses were conducted for sidewalks and crosswalks adjacent to the site at twelve study area locations during the morning, midday, and evening peak hours to determine existing conditions. The results of these analyses are presented in Tables III-24 and III-25 for walkways and crosswalks, respectively. Under existing conditions, all study area sidewalks and crosswalks operate acceptably (Level-of-service C or better) under average conditions for all peak hours. For the platoon and surge conditions, all locations continue to operate acceptably (Level-of-service D or better) for all peak hours.

TABLE III-24
EXISTING PEDESTRIAN CROSSWALK
LEVEL-OF-SERVICE SUMMARY

<u>Crossing</u>	<u>Location Designation</u>	<u>Corner</u>	<u>Period</u>	<u>Average Space</u>		<u>Surge Space***</u>	
				<u>Existing Space*</u>	<u>LOS**</u>	<u>Existing Space</u>	<u>LOS</u>
Boylston at Hereford	A	Northeast	Morning	708	A	531	A
			Midday	472	A	274	A
			Evening	708	A	531	A
Hereford at Boylston	A	Northeast	Morning	174	A	88	B
			Midday	189	A	88	B
			Evening	142	A	64	B
Boylston at Dalton	A	Southwest	Morning	529	A	496	A
			Midday	378	A	248	A
			Evening	378	A	248	A
Dalton at Boylston	A	Southwest	Morning	254	A	179	A
			Midday	203	A	179	A
			Evening	145	A	134	A
Boylston at Gloucester	B	Northwest	Morning	246	A	151	A
			Midday	77	B	41	B
			Evening	181	A	90	B
Gloucester at Boylston	B	Northwest	Morning	453	A	127	B
			Midday	159	A	51	B
			Evening	218	A	69	B
Boylston at Fairfield	C	Northwest	Morning	108	B	111	B
			Midday	25	C	28	C
			Evening	37	C	40	C
Fairfield at Boylston	C	Northwest	Morning	459	A	231	A
			Midday	123	B	59	B
			Evening	230	A	109	B
Boylston at Exeter	D	Northwest	Morning	416	A	133	A
			Midday	131	A	40	B
			Evening	236	A	73	B
Exeter at Boylston	D	Northwest	Morning	144	A	31	C
			Midday	138	A	30	C
			Evening	95	B	23	D

* Flow rate = pedestrians/minute/feet.

** Level-of-service.

*** Platoon effect = average flow + 4.

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TABLE III-24 (Continued)
EXISTING PEDESTRIAN CROSSWALK
LEVEL-OF-SERVICE SUMMARY

<u>Crossing</u>	<u>Location Designation</u>	<u>Corner</u>	<u>Period</u>	<u>Average Space</u>		<u>Surge Space***</u>	
				<u>Existing Space*</u>	<u>LOS**</u>	<u>Existing Space</u>	<u>LOS</u>
Boylston at Exeter	D	Southeast	Morning	451	A	103	B
			Midday	901	A	199	B
			Evening	334	A	76	B
Exeter at Boylston	D	Southeast	Morning	358	A	93	B
			Midday	239	A	62	B
			Evening	117	B	30	C
Huntington at Exeter	E	Northwest	Morning	253	A	193	A
			Midday	246	A	188	A
			Evening	240	A	162	A
Exeter at Huntington	E	Northwest	Morning	633	A	164	A
			Midday	298	A	74	B
			Evening	199	A	49	B
Huntington at East Ring	F	Northwest	Morning	692	A	594	A
			Midday	346	A	229	A
			Evening	495	A	495	A
East Ring at Huntington	F	Northwest	Morning	898	A	360	A
			Midday	1,496	A	495	A
			Evening	748	A	264	A
Huntington at Belvidere	G	Northeast	Morning	130	A	79	B
			Midday	204	A	128	B
			Evening	106	B	66	B
Belvidere at Huntington	G	Northeast	Morning	924	A	378	A
			Midday	1,189	A	520	A
			Evening	2,773	A	1,387	A
Belvidere/ South Ring at Garage	J	Northeast	Morning	94	B	72	B
			Midday	60	B	48	B
			Evening	44	B	36	C
Garage at Belvidere/ South Ring	J	Northeast	Morning	489	A	203	A
			Midday	244	A	108	B
			Evening	684	A	287	A

* Flow rate = pedestrians/minute/feet.

** Level-of-service.

*** Platoon effect = average flow + 4.

2192/489/wpr-HT4

TABLE III-24 (Continued)
EXISTING PEDESTRIAN CROSSWALK
LEVEL-OF-SERVICE SUMMARY

<u>Crossing</u>	<u>Location Designation</u>	<u>Corner</u>	<u>Period</u>	<u>Average Space</u>		<u>Surge Space***</u>	
				<u>Existing Space*</u>	<u>LOS**</u>	<u>Existing Space</u>	<u>LOS</u>
Belvidere at Dalton	K	Northeast	Morning	2,055	A	1,560	A
			Midday	1,498	A	520	A
			Evening	1,498	A	520	A
Dalton at Belvidere	K	Northeast	Morning	52	B	58	B
			Midday	99	B	53	B
			Evening	68	B	59	B

* Flow rate = pedestrians/minute/feet.

** Level-of-service.

*** Platoon effect = average flow + 4.

TABLE III-25
EXISTING PEDESTRIAN WALKWAY
LEVEL-OF-SERVICE SUMMARY

<u>Crossing</u>	<u>Location Designation</u>	<u>Corner</u>	<u>Period</u>	<u>Average Space</u>		<u>Surge Space***</u>	
				<u>Existing Space*</u>	<u>LOS**</u>	<u>Existing Space</u>	<u>LOS</u>
Boylston St. at Gloucester St.	B	South Sidewalk	Morning	0.4	A	4.4	B
			Midday	0.6	A	4.6	B
			Evening	0.9	A	4.9	B
Boylston St. at Fairfield St.	C	South Sidewalk	Morning	0.7	A	4.7	B
			Midday	1.3	A	5.3	B
			Evening	0.8	A	4.8	B
Huntington at Exeter	E	Northwest Sidewalk	Morning	0.2	A	4.2	B
			Midday	0.1	A	4.1	B
			Evening	0.1	A	4.1	B
Prudential Footbridge	F	Over Huntington Avenue	Morning	3.9	B	7.9	C
			Midday	2.8	B	6.8	B
			Evening	4.1	B	8.1	C
Huntington at East Ring Rd.	F	Northwest Sidewalk	Morning	0.1	A	4.1	B
			Midday	0.5	A	4.5	B
			Evening	0.3	A	4.3	B
Huntington at Belvidere	G	Northeast Sidewalk	Morning	0.3	A	4.3	B
			Midday	0.2	A	4.2	B
			Evening	0.1	A	4.1	B
Belvidere/ South Ring Rd. at Garage	J	Northwest Sidewalk	Morning	0.4	A	4.4	B
			Midday	0.8	A	4.8	B
			Evening	0.3	A	4.3	B

* Flow rate = pedestrians/minute/feet.

** Level-of-service.

*** Platoon effect = average flow + 4.

3. FUTURE CONDITIONS

To assess the impacts of the proposed Prudential Center Redevelopment on the transportation system within the study area, separate travel demand estimates were made for each land use and type of trip (work or non-work) for the new development. Projected trips were then distributed to the various transportation networks--roadway, transit and pedestrian. Appropriate criteria for measures of effectiveness were selected and used to define the project impacts (Build conditions) when compared to future (1994 and 1999) conditions without the proposed development (No-Build).

These analyses were conducted for unmitigated and mitigated project volumes. Unmitigated volumes are those expected if existing travel behavior to the Prudential Center continues for future Build conditions, while mitigated volumes are those expected if the goals established in the Mitigation Plan for changing travel behavior are realized. These goals include increasing transit usage and ridesharing based on the extensive mitigation program adopted by the developer.

The results of several surveys--conducted in 1987 by Cambridge Systematics, Inc. in association with HMM Associates, Inc.--were used: (1) to estimate the number of existing trips to the Prudential Center by mode of travel; and (2) to project the number of trips generated by future development at the site assuming existing travel patterns continue. The surveys included Prudential Center employees (office, retail, and hotel), visitors, residents, and garage parkers. Trip generation surveys conducted by Vanasse Hangen Brustlin, Inc. in downtown Boston were also used to supplement information about existing and future travel demand characteristics.

3.1 Project Travel Demand

Future travel demands, with and without mitigation, were projected using daily person-trip generation rates for the proposed new office and retail uses by type of trip (work and non-work). Travel mode (vehicle, transit, or walk) percentages, vehicle occupancy rates (average number of persons per vehicle), and peak hour factors were then applied to the resulting person

trips to derive peak hour trips by mode. Different mode splits and vehicle occupancy rates (VOR) were used for the unmitigated and mitigated analyses. A lower auto mode percentage and higher VORs were used for mitigated conditions based on the goals set forth in the Mitigation section of this report. Vehicle-trip generation rates for residential uses were used directly and were not altered for the Transportation Mitigation Plan, which is primarily aimed at office and retail employees.

3.1.1 Office and Retail Trip Generation

The daily person-trip generation rates used for office and retail land uses are shown below in Table III-26. Person-trip generation rates for the office and retail land uses have been classified as work and non-work. Work-related trips are defined as the daily commuting trips to and from the place of work. Non-work trips include all other non-commuting trips made by employees and all trips made by visitors to the site.

Information on non-work trips made by visitors has generally been available, however, a significant number of non-work trips are also made by Prudential Center employees. The trip generation rates do not include this important component. As a result, total daily trips have not been calculated. It should be stressed that although the number of employee non-work trips is essential to accurately calculate daily trips, it is not needed to calculate peak hour vehicular travel demand. This is because employee non-work trips are generally not made during the peak hours when employee work trips are made. Nor is this figure needed to calculate parking demand because parking demand for employees is based on how many drive to work and not on how many times employees use their cars during the day. Therefore, the lack of calibration of daily employee non-work trips has no impact on the critical analysis of peak hour vehicle trips or peak period parking demand.

TABLE III-26
DAILY PERSON-TRIP GENERATION RATES*

<u>Use</u>	<u>User</u>	<u>In</u>	<u>Out</u>	<u>Total</u>
Office	Work**	3.30	3.30	6.60
	Visitor***	<u>2.50</u>	<u>2.50</u>	<u>5.00</u>
	TOTAL	5.80	5.80	11.60
Retail***	Work	2.75	2.75	5.50
	Non-Work	<u>15.60</u>	<u>15.60</u>	<u>31.20</u>
	TOTAL	18.35	18.35	36.70

* Trips per 1,000 square feet.

** Based on peak employment in the Prudential Tower and 101 Huntington Avenue of 6,100 persons and a 10 percent absentee rate.

*** Based on Copley Place EIR (September 1980).

Table III-27 shows the mode split percentages used for office and retail uses based on current travel behavior. The factors for office/retail work trips and office/retail non-work trips were based on results from the Prudential Center surveys performed by Cambridge Systematics, Inc. Retail mode split percentages were derived from surveys of Prudential Center shoppers conducted by First Market Research. Because of the supply of parking spaces available on-site in the Prudential Center Garage (the cost of which is subsidized by employers in many cases), the auto mode share for work trips is somewhat higher than in other areas of downtown Boston where rates of 30 to 40 percent by automobile are not unusual. Non-work trips for both the office and retail uses have a higher percentage of walk trips than do work trips, due to the proximity of the Hynes Convention Center, the Sheraton Hotel, and many other businesses and services. For the mitigated volumes presented later, the office work-trip automobile percentage was reduced and the transit percentage was increased to reflect the higher transit use expected by implementing the mitigation program.

TABLE III-27
MODE SPLIT PERCENTAGES

<u>Use</u>	<u>User</u>	<u>Auto</u>	<u>Travel Mode</u>	
			<u>Transit</u>	<u>Walk</u>
Office	Work*	50	47	3
	Non-Work**	60	17	23
Retail	Work**	31	54	15
	Non-Work***	22	23	55

* Derived from a Cambridge Systematics, Inc. survey of Prudential Center office employees (1987); City of Boston Draft Transportation Access Plan Guidelines by the Boston Transportation Department (1988); and Access-Oriented Parking Strategy (1983).

** Cambridge Systematics, Inc. Prudential Survey (1987).

*** Profile of 1986 Christmas Season Visitors to Copley Place, Newbury Street, and the Prudential Center; First Market Research (January 1987).

Vehicle occupancy rates (VOR) describe the average number of persons per vehicle. These rates are then applied to the number of person trips by automobile to derive the number of vehicle trips generated by the site. The rates used for this analysis are shown in Table III-28. The office work and non-work trips rates were derived from the Prudential Center surveys, as was the rate for retail work trips. The retail non-work VOR was based on the results of a Prudential Center shoppers survey conducted by First Market Research. For the mitigated trip generation, all work VORs were increased to reflect the greater ridesharing expected by implementing the mitigation program.

Table III-29 displays the percentage of daily arrivals and departures expected to occur during the morning and evening peak hours. Different peak hour factors have been applied based on the type of trip (work or non-work), land use, and mode of travel. The majority of trips occurring during the peak hours are work trips made by commuters. The peaking characteristics are greater for work trips by transit and walk than for trips by automobile, based on survey data and Prudential Center Garage data. These differences in peaking by travel mode appear to be due to differences in the type of worker responsibilities and hours worked between drivers and transit riders.

TABLE III-28
VEHICLE OCCUPANCY RATES

<u>Use</u>	<u>User</u>	<u>VOR*</u>
Office**	Work	1.5
	Non-Work	1.2
Retail	Work**	1.4
	Non-Work***	1.6

* Average number of people per vehicle.

** Cambridge Systematics, Inc. Prudential Survey (1987).

*** Profile of 1986 Christmas Season Visitors to Copley Place, Newbury Street, and the Prudential Center; First Market Research (January 1987).

TABLE III-29
PERCENT OF DAILY IN AND OUT TRIPS
DURING PEAK HOURS

<u>Use</u>		<u>Work</u>				<u>Non-Work</u>	
		<u>AM Peak</u>		<u>PM Peak</u>		<u>AM Peak</u>	<u>PM Peak</u>
		<u>Auto</u>	<u>Transit/ Walk</u>	<u>Auto</u>	<u>Transit/ Walk</u>	<u>All Modes</u>	<u>All Modes</u>
Office	In	34%	55%	1%	2%	10%	2%
	Out	4	1	34	55	1	10
Retail	In	18	10	1	10	1	5
	Out	4	1	18	20	1	10

Source: Office and retail automobile work trip percentages are based on Prudential Center Garage data. Office and retail transit work and all non-work trip percentages are from the Fan Pier/Pier 4 FEIR (September 1986).

It should be stressed that all the trip generation factors were established based on estimates of existing conditions at the site. The rates reported above were applied to existing uses at the Prudential Center to replicate existing peak hour vehicle travel demand, daily arrivals, and peak period parking. An exact calibration is not possible because not all Prudential Center traffic parks on-site and some traffic parking in the Prudential Center Garage is generated by off-site uses. As a result, only estimates of Prudential Center peak hour traffic, daily traffic, and peak parking demand are available. A variety of sources including surveys of Prudential Center parkers, workers, visitors, and residents were used to establish initial values for the trip generation factors. These factors were then adjusted to match the estimates of existing conditions.

3.1.2 Residential Trip Generation

The residential-trip generation rates used are shown in Table III-30. Daily and peak hour vehicle-trip generation rates for residential land use were derived from the Prudential Center survey of residents conducted by Cambridge Systematics, Inc. The survey showed that 36 percent of residential trips were made by automobile, while 25 and 39 percent were made by transit and walking, respectively. These mode split factors were then applied to the number of vehicle trips to derive the projected number of residential transit and walk trips.

TABLE-III-30
RESIDENTIAL-TRIP GENERATION RATES

	<u>Vehicle*</u>	<u>Transit**</u>	<u>Walk**</u>
Daily	3.10	2.15	3.36
<u>Morning Peak Hour</u>			
In	0.12	0.08	0.13
Out	<u>0.14</u>	<u>0.10</u>	<u>0.15</u>
TOTAL	0.26	0.18	0.28
<u>Evening Peak Hour</u>			
In	0.11	0.08	0.12
Out	<u>0.11</u>	<u>0.08</u>	<u>0.12</u>
TOTAL	0.22	0.16	0.24

* Vehicle trips per dwelling unit.

** Person trips per dwelling unit.

3.1.3 New Project Travel Demand without Mitigation

The unmitigated travel demand characteristics detailed above for the various land uses were applied to the Alternative A scenario of the proposed 1994 and 1999 Prudential Center Redevelopment, shown previously in Table III-1. The resultant peak hour trips by travel mode are displayed in Table III-31 for 1994 and 1999.

TABLE III-31
1994 AND 1999 NEW PROJECT TRAVEL DEMANDS WITHOUT MITIGATION

	<u>Auto*</u>	<u>1994</u> <u>Transit**</u>	<u>Walk**</u>	<u>Auto*</u>	<u>1999</u> <u>Transit**</u>	<u>Walk**</u>
<u>Morning</u> <u>Peak Hour</u>						
In	449	799	116	575	978	186
Out	<u>56</u>	<u>24</u>	<u>20</u>	<u>111</u>	<u>63</u>	<u>77</u>
TOTAL	505	823	136	686	1,041	263
<u>Evening</u> <u>Peak Hour</u>						
In	48	82	81	100	151	176
Out	<u>477</u>	<u>867</u>	<u>234</u>	<u>623</u>	<u>1,103</u>	<u>401</u>
TOTAL	525	949	315	723	1,254	577

* Vehicle trips including delivery vehicles and taxis.

** Person trips.

Most of the new travel demands will occur by 1994, when the proposed Prudential Center Redevelopment is projected to generate more than 500 new vehicle trips in both the morning and evening peak hours. The largest number of trips will be transit trips with almost 825 morning trips and nearly 950 evening trips. Walk trips are projected to total 136 in the morning and 315 in the evening peak hour. These projections are without implementing any mitigation measures.

During the morning peak hour in 1999, new vehicle trips are projected to total 686, while the evening peak hour new vehicle trips are projected to total 723. For public transportation, the morning peak hour volume is projected to be 1,041 person trips, while the evening peak hour volume would be 1,254 person trips. Because of the large number of commuters, walk trips would be the smallest component in the peak hour with 263 morning trips and 577 evening trips. Again, all of these projections are for the unmitigated project.

3.1.4 New Project Travel Demand With Mitigation

The extensive mitigation measures outlined in the mitigation section include travel demand management, public transportation improvements, and parking management. These measures are expected to significantly reduce the number of new project-related vehicle trips. These measures will be applied to both the existing center as well as to the new development. This section discusses the impacts of these measures on reducing the number of additional trips generated by the Prudential Center Redevelopment.

Mitigated weekday peak hour trips were generated using the same methodology described earlier for weekday unmitigated trip generation. Two trip generation factors, however, were altered from the weekday unmitigated trip generation to reflect the effect of mitigation measures on travel behavior. These factors are the vehicle occupancy rates and travel mode split.

One goal of the travel demand mitigation program is to reduce the office work automobile mode split from 50 percent to 45 percent. It is expected that these trips would shift to transit, resulting in an increase in the transit percentage from 47 percent to 52 percent. Another goal of the program is to increase the vehicle occupancy rate for office work trips to 1.8 from 1.5, and to increase the rate for retail and hotel work trips to 1.6 from 1.4.

Using these revised factors, future year trips were generated for the existing development at the Prudential Center and the proposed new development (Alternative A). Table III-32 compares additional morning and evening peak hour inbound and outbound volumes for the

Prudential Center without mitigation and with mitigation. It is expected that the critical evening peak hour outbound volume would be reduced by 248 vehicle trips as a result of meeting the above mitigation goals for both the existing Prudential Center and the proposed new development. A similar reduction is expected in the morning peak hour inbound volume. These changes represent reductions of 43 percent and 40 percent, respectively, in the morning and evening peak direction volumes.

TABLE III-32
EFFECT OF MITIGATION ON 1999 NEW VEHICLE TRIPS

<u>Description</u>	<u>New Vehicle Trips</u>		<u>Reduction</u>	
	<u>Without Mitigation</u>	<u>With Mitigation*</u>	<u>Number</u>	<u>Percent</u>
<u>Morning Peak Hour</u>				
In	575	327	248	43%
Out	<u>111</u>	<u>81</u>	<u>30</u>	<u>27%</u>
TOTAL	686	408	278	41%
<u>Evening Peak Hour</u>				
In	100	91	9	9%
Out	<u>623</u>	<u>375</u>	<u>248</u>	<u>40%</u>
TOTAL	723	466	257	36%

* Mitigation program applied to both the existing Prudential Center and the proposed development.

3.1.5 Total 1999 Prudential Center Travel Demand

The existing Prudential Center site contains office, retail, residential, and hotel uses. The existing development on the site is summarized below in Table III-33.

TABLE III-33
EXISTING LAND USE

<u>Land Use</u>	<u>Size</u>
Office	1,679,565 Square Feet
Retail	446,083 Square Feet
Hotel	1,225 Rooms
Housing	781 Dwelling Units
Parking	3,028 Spaces

In general, the same trip generation rates were used to project trips generated by the proposed new uses at the Prudential Center as were used to estimate the number of trips generated by the existing development on the site. It should be noted, however, that there is a difference in the daily office work trip rate for the existing and proposed new uses. The existing rate was estimated as being 6.0 work trips per 1,000 square feet of office space. This was based on a current estimate of 5,500 office employees in the Prudential Tower and 101 Huntington Avenue office buildings. This level of employment appears to be historically low and a higher density of employees can be expected in the new office buildings. As a result, a higher rate of 6.6 work trips per 1,000 square feet of office space was used for future office uses (based on a peak employment level of 6,100 for the existing office buildings). Rates for estimating trip generation for the existing hotel were taken from the Copley Place and Fan Pier/Pier 4 Final Environmental Impact Reports. These rates are used only to estimate existing conditions for comparative purposes because no new hotel uses are proposed for the project.

Tables III-34 and III-35 display total 1999 Prudential Center peak hour volumes for automobile and transit travel modes, respectively. These volumes are based on travel demand without mitigation. Under Build conditions in 1999, vehicle and transit trips generated by the new development are projected to comprise roughly one-third of the total morning and evening peak hour vehicle and transit trips generated by the site.

TABLE III-34
1999 VEHICLE TRIPS WITHOUT MITIGATION

	<u>Existing Development</u>	<u>New Development</u>	<u>Total Center</u>
<u>Morning Peak Hour</u>			
In	1,059	575	1,634
Out	<u>356</u>	<u>111</u>	<u>467</u>
TOTAL	1,415	686	2,101
<u>Evening Peak Hour</u>			
In	404	100	504
Out	<u>1,172</u>	<u>623</u>	<u>1,795</u>
TOTAL	1,576	723	2,299

TABLE III-35
1999 TRANSIT TRIPS WITHOUT MITIGATION

	<u>Existing Development</u>	<u>New Development</u>	<u>Total Center</u>
<u>Morning Peak Hour</u>			
In	1,647	978	2,625
Out	<u>226</u>	<u>63</u>	<u>289</u>
TOTAL	1,873	1,041	2,914
<u>Evening Peak Hour</u>			
In	416	151	567
Out	<u>1,884</u>	<u>1,103</u>	<u>2,987</u>
TOTAL	2,300	1,254	3,554

Tables III-36 and III-37 provides total 1999 mitigated Prudential Center vehicle and transit trips. With mitigation, total new morning and evening peak hour vehicle trips are projected to decline by 278 and 257, respectively. These reductions would result from the expected increase in carpooling and vanpooling, and a shift to transit use. As a result of the shift from vehicle to transit trips, total morning and evening peak hour transit trips for the Prudential Center are projected to increase by 233 and 238, respectively.

TABLE III-36
1999 VEHICLE TRIPS WITH MITIGATION

	<u>Existing Development</u>	<u>New Development</u>	<u>Total Center</u>
<u>Morning Peak Hour</u>			
In	909	477	1,386
Out	<u>338</u>	<u>99</u>	<u>437</u>
TOTAL	1,247	576	1,823
<u>Evening Peak Hour</u>			
In	398	97	495
Out	<u>1,022</u>	<u>525</u>	<u>1,547</u>
TOTAL	1,420	622	2,042

TABLE III-37
1999 TRANSIT TRIPS WITH MITIGATION

	<u>Existing Development</u>	<u>New Development</u>	<u>Total Center</u>
<u>Morning Peak Hour</u>			
In	1,785	1,069	2,854
Out	<u>228</u>	<u>65</u>	<u>293</u>
TOTAL	2,013	1,134	3,147
<u>Evening Peak Hour</u>			
In	422	154	576
Out	<u>2,022</u>	<u>1,194</u>	<u>3,216</u>
TOTAL	2,444	1,348	3,792

3.1.6 Saturday Trip Generation

For the Saturday midday analysis, traffic was projected only for the retail and residential portion of the project. Data obtained from sign-in logs for the 101 Huntington Avenue office building indicate that approximately 100 tenant employees enter the building during the day on Saturday. Based on this information, it is expected that the Saturday midday peak hour vehicle-trip generation from the new office uses will be minor.

For the retail and residential uses, VHB found that there is a general lack of information regarding Saturday trip generation in the Back Bay area. Saturday retail and high-rise apartment trip generation rates, obtained from the Institute of Transportation Engineers (ITE) report, Trip Generation, were examined. The retail rates were high for the Back Bay area, which is well served by transit and where many residents are within walking distance of much of the retail activity. As a result, an approach similar to that used to project weekday peak hour travel demand was used. Several factors, however, were altered from the weekday analysis to reflect differences in Saturday and weekday travel behavior. These factors include vehicle mode split, peak hour percentages, and the vehicle occupancy rate for non-work trips.

The Saturday non-work vehicle mode split was increased from 22 percent to 50 percent to reflect the greater automobile usage expected on weekend days. In addition, the percent of daily inbound and outbound non-work trips occurring during the midday peak hour was increased to 18 percent. Finally, the retail non-work auto occupancy rate was raised to 1.9 from the 1.6 level used for the weekday trip generation. These changes in factors were based, in part, on the Parcel 1B, Harvard Square Final EIR (EOEA #3176), which extensively analyzed Saturday retail-trip generation in nearby Cambridge.

For the Saturday residential-trip generation, the ITE report provided a ratio of the Saturday midday peak hour trip generation rate to the weekday evening peak hour rate for a high-rise apartment. The ITE vehicle-trip rates were not used directly because they generally are based on locations not as well served by transit. It was assumed, however, that the same

relationship between Saturday midday and weekday evening peak hour traffic found in the ITE report would apply to the Prudential Center. This information was applied to the weekday evening peak hour trip generation described earlier to project Saturday midday peak hour trips. Table III-38 shows projected Saturday midday peak hour entering and exiting volumes for 1994 and 1999.

TABLE III-38
1994 AND 1999 NEW SATURDAY MIDDAY
PEAK HOUR VEHICLE TRIPS

<u>Year</u>	<u>In</u>	<u>Retail</u> <u>Out</u>	<u>Total</u>	<u>In</u>	<u>Housing</u> <u>Out</u>	<u>Total</u>	<u>In</u>	<u>Total</u> <u>Out</u>	<u>Total</u>
1994	113	123	236	12	12	24	125	135	260
1999	210	230	440	35	35	70	245	265	510

3.1.7 Trip Generation for Alternative Build Programs

Table III-39 displays total 1999 vehicle trips for Alternative A, B, and C (described in the Preface and Introduction sections). Mitigated and unmitigated volumes for Alternatives B and C were calculated using the methodology described earlier for calculating Alternative A trip generation.

Comparing Alternative A unmitigated project volumes to Alternative B unmitigated project volumes in the morning and evening peak hours shows a reduction of 14 and 15 percent, respectively. Comparing Alternative B unmitigated project volumes to Alternative C unmitigated project volumes in the morning and evening peak hours shows additional reductions of 8 and 10 percent, respectively. The percentage reduction from unmitigated to mitigated project volumes is larger with the smaller alternatives. In the morning peak hour, the reductions range from 41 percent for Alternative A to 47 percent for Alternative C. In the evening peak hour, the reductions range from 36 percent for Alternative A to 42 percent for Alternative C. This results from the relatively larger impact of mitigation on the existing Prudential Center with the smaller alternatives.

TABLE III-39
1999 TRIP GENERATION COMPARISON
ALTERNATIVES A, B AND C
UNMITIGATED AND MITIGATED NET NEW VEHICLE TRIPS

<u>Time</u>	<u>Alternative A</u>		<u>Alternative B</u>		<u>Alternative C</u>	
	<u>Unmitigated</u>	<u>Mitigated</u>	<u>Unmitigated</u>	<u>Mitigated</u>	<u>Unmitigated</u>	<u>Mitigated</u>
<u>Morning Peak Hour</u>						
In	575	327	493	259	455	227
Out	<u>111</u>	<u>81</u>	<u>97</u>	<u>69</u>	<u>87</u>	<u>60</u>
TOTAL	686	408	590	328	542	287
<u>Evening Peak Hour</u>						
In	100	91	85	77	73	65
Out	<u>623</u>	<u>375</u>	<u>530</u>	<u>296</u>	<u>483</u>	<u>255</u>
TOTAL	723	466	615	373	556	320

For Alternative A2, there would be a shift in the location of some land uses from Alternative A, but the total program would be essentially the same. Stage I primarily involves the area south of the Massachusetts Turnpike by 1994, and Stage II involves reconstruction on the north side of the Prudential Center, to be completed by 1999. For Alternative A2, there will be a shift of approximately 110,000 square feet of office space from the south side of the project during Stage I (1994) to the north side during Stage II (1999). Conversely, 150 residential units will be shifted from the north in Stage II to the south in Stage I. Overall, there is only a small net change in total development size.

Vehicle trips generated in the evening peak hour were analyzed to determine if any significant difference in roadway impacts would occur between Alternative A and Alternative A2. Only evening peak hour volumes were analyzed because they represent the greatest one-hour volumes over the course of a day. During Stage I in 1994, Alternative A2 would generate about 25 fewer vehicles than Alternative A. At the end of Stage II in 1999, Alternative A2 would

generate approximately 25 more vehicles on the north side of the Prudential Center than Alternative A, but overall, there would be no difference in total traffic to the site.

Even though there would be some shifting of volumes associated with Alternative A2, the impact on traffic conditions is expected to be insignificant compared with Alternative A. Other factors will further reduce the impact of these traffic volume shifts. Parking, street patterns, and travel times all affect how drivers use roadways directly around the Prudential Center. These factors would disperse the shifted traffic volumes associated with Alternative A2 and reduce the traffic impact to any single intersection. Traffic volumes outside of the Prudential area would be unaffected because the geographic distribution of drivers would remain unchanged.

Traffic volumes generated by Alternatives B2 and C2 are also expected to have an insignificant impact on study intersections compared with Alternatives B and C, respectively. Alternatives B and C are simply scaled-down versions of the proposed Full-Build condition, Alternative A. Alternatives B2 and C2 have the same relationship to Alternatives B and C, respectively, as Alternative A2 has to Alternative A. Therefore, Alternatives B2 and C2 are expected to produce only small traffic volume shifts when compared with Alternatives B and C, respectively. These shifts are expected to have little or no impact on study intersections.

3.1.8 Daily Delivery Vehicle and Taxi Trips

A portion of the vehicle-trip generation rates described previously consists of taxis and delivery vehicles. Delivery vehicles are typically single-unit, two-axle vans, but may also include large trucks. Table III-40 summarizes the expected increase in daily delivery vehicle traffic for the office and retail uses. These estimated increases are based on existing deliveries to the Prudential Center and projected increases in deliveries to the expanded supermarket. Based on the loading dock survey, a minor amount of delivery vehicle traffic would be associated with the residential uses.

TABLE III-40
NET NEW DAILY DELIVERY VEHICLE ARRIVALS

	<u>Office/Retail</u>	<u>Supermarket Expansion</u>	<u>Total</u>
Generation Rates	0.12 Arrivals/ 1,000 SF*	N/A	—
1994 Arrivals	118	26**	144
1999 Arrivals	150	26	176

* Based on the survey of existing Prudential Center loading docks taken in November 1988.

** Estimate based on conversations with supermarket representatives.

Under 1994 Stage I conditions, the project is expected to generate 144 new delivery vehicle arrivals per day. Assuming a constant distribution (as was observed with existing deliveries) over a nine-hour day, approximately sixteen new delivery vehicles are expected to arrive at the site each hour. Under 1999 Full-Build conditions, 176 new delivery arrivals per day are projected, or twenty vehicles each hour over the course of a nine-hour day. A description of proposed changes in loading facilities to accommodate this increased activity is provided in a later section.

Table III-41 provides the number of taxi arrivals projected under both the 1994 and 1999 Build scenarios. Daily taxi arrivals are projected to increase by 173 by 1994 and by 230 at the completion of the project in 1999.

TABLE III-41
NET NEW DAILY TAXI ARRIVALS

	<u>Office</u>	<u>Retail</u>	<u>Total</u>
Generation Rates	0.75 arrivals/ 100 person trips	0.75 arrivals/ 100 person trips	
1994 Arrivals	133	40	173
1999 Arrivals	156	74	230

* Urban Travel Patterns for Hospitals, Universities, Office Buildings, and Capitols;
based on Highway Research Board, National Cooperative Highway Research
Program Report No. 62 (1969).

3.2 Background Development

To assess future conditions, it is not only necessary to project development-related traffic increases, but also to project increases in background traffic. Area traffic growth is a function of other new development in the area. This growth can be projected by applying a generalized growth factor or by assessing specific development projects and proposals. For this analysis, a combination of both approaches was used. Information about possible and proposed new development in the Back Bay and the South End expected by 1994 was provided by the Boston Redevelopment Authority (BRA). The list of background developments considered for analysis in the 1994 No-Build scenario is shown in Table III-42. Traffic volumes from projects that were either proposed, under construction, or unoccupied as of September 1988, were added to existing traffic volumes to represent 1994 No-Build traffic volumes. Traffic from projects that were either fully or partially occupied as of September 1988, was considered to already be included in the existing traffic volumes. Thus, traffic generation from the occupied portions of these projects was not included in the 1994 No-Build volumes.

<u>Development/Location</u>	<u>Total SF</u>	<u>Office SF</u>	<u>Retail SF</u>	<u>Residential Units</u>	<u>Parking Spaces</u>	<u>Status*</u>
222 Berkeley Street	505,000	470,000	35,000		400	Approved
500 Boylston Street	720,000	645,000	75,000		550	Office - Occupied; Retail - Partially Unoccupied
420 Boylston Street	97,912	84,947	12,965			Office - Unoccupied; Retail - 60% Occupied
425 Boylston Street	32,000	29,000	3,000			Under Construction
745 Boylston Street	119,000	90,000	17,000		12	Unoccupied
855 Boylston Street	165,470	159,420	6,050		33	Occupied
30 Garrison Street	43,046	0	0	52		Under Construction
32 Garrison Street	86,494	0	0	74	77	Under Construction
25 Huntington Avenue	208,000	38,000	10,000	110	248	Proposed
116 Huntington Avenue	252,700	239,000	13,700		58	Under Construction
Hynes Convention Center	590,000					Partially Complete and Operational
Leighton Park (formerly Tent City), Dartmouth Street, and Columbus Avenue	255,740	0	6,250	271	698	Housing - 98% Occupied; Retail - Unoccupied
360 Newbury Street	114,772	70,000	44,772		0	Office - Unoccupied; Retail - Occupied

* Status as of September 1, 1988. Note: Occupied represents 100 percent occupancy and vacant represents 100 percent vacant.
Source: Boston Redevelopment Authority.

TABLE III-42 (Continued)
PRUDENTIAL CENTER REDEVELOPMENT
BACKGROUND DEVELOPMENT SUMMARY

<u>Development/Location</u>	<u>Total SF</u>	<u>Office SF</u>	<u>Retail SF</u>	<u>Residential Units</u>	<u>Parking Spaces</u>	<u>Status*</u>
Parcel 6 on Massachusetts Avenue and St. Botolph Street	93,000	25,000 (Theater)	3,000	70	75	Proposed
Prince School on Newbury Street	68,100	0	24,900	36	20	Housing - 50% Occupied; Retail - 80% Occupied
56 St. Botolph Street	39,000	0	0	32		Proposed
Pavilion Corporation and Park Plaza	338,000	75,000	25,000	110	200 to 265	Proposed
Heritage on the Garden	485,501	122,000	50,000	87	180	Office - 15% Occupied; Retail - 5% Occupied; Housing - 15% Occupied

* Status as of September 1, 1988. Note: Occupied represents 100 percent occupancy and vacant represents 100 percent vacant.
Source: Boston Redevelopment Authority.

As Table III-43 indicates, 739 additional vehicle trips are expected during the morning peak hour during 1994 for background developments in the area; in the evening peak hour, the projected number is 1,401. The projected number of evening peak hour trips generated by background developments is approximately three times the projected number of trips from the Prudential Center Redevelopment using Alternative A mitigated volumes.

The largest number of evening peak hour background trips would be from the Hynes Convention Center, which is projected to produce 467 outbound vehicle trips in the evening peak hour. This number is more than one-third the total of outbound trips projected for all background development. Although the Hynes Convention Center was open during the time some of the traffic turning movement counts were made, many of the counts were taken when no events were in progress. Further, those events that were in progress during the counts were smaller than those events occurring on an average event day. Therefore, since only a small portion of Hynes-generated traffic was captured in the existing traffic volumes, the Hynes Convention Center was treated as a background development and traffic generated by it was considered in the analysis of future conditions. The approach used for estimating the impact of the Hynes Convention Center as a background development is the same as was used for the 500 Boylston Street Environmental Impact Report. The volumes used for the Hynes Convention Center are those expected with a large regional conference. They do not represent days of greatest impact, but do exceed an average volume.

Hynes traffic volumes are expected to be less than or equal to the level used for this analysis on 77 percent of all event days (Hynes Auditorium DEIR, EOE A #5046, August 1984). The number of Hynes event days are expected to equal 318, including Saturdays. It is expected that approximately 80 percent of all weekdays will have less traffic generated by the Hynes Convention Center than the volume used for this analysis. A larger Hynes impact is expected about fifty weekdays per year. The No-Build and Build level-of-service analyses presented later represent the projected situation for the 80th percentile weekday and not for the average day. In most cases, conditions will be better than those presented in the analysis results.

TABLE III-43
BACKGROUND DEVELOPMENT
1994 VEHICLE-TRIP GENERATION

Location Number	Description	Morning Peak Hour		Evening Peak Hour	
		In	Out	In	Out
1	222 Berkeley Street and 500 Boylston Street	224	0	0	276
2	420 Boylston Street and 425 Boylston Street	63	2	5	74
3	745 Boylston Street	57	2	7	71
4	30 Garrison Street, 32 Garrison Street, and 56 St. Botolph	13	21	24	24
5	25 Huntington Avenue	30	15	20	45
6	116 Huntington Avenue	46	0	0	87
7	Hynes Convention Center	50	0	0	467*
8	Leighton Park (formerly Tent City), Dartmouth Street, and Columbus Avenue	1	1	2	4
9	360 Newbury Street	38	1	2	43
10	Parcel 6 on Massachusetts Avenue and St. Botolph Street	6	9	11	12
11	Prince School on Newbury Street	2	2	4	5
12	Pavilion Corporation and Park Plaza	52	16	24	74
13	Heritage on the Garden	67	12	25	97
TOTAL		649	81	124	1,279

Sources: 1 500 Boylston Street EIR.
2-5 Calculated by Vanasse Hangen Brustlin, Inc.
6 116 Huntington Avenue EIR.
7 Hynes Auditorium EIR and 500 Boylston Street EIR.
8-13 Calculated by Vanasse Hangen Brustlin, Inc.

*The analysis for the Hynes Convention Center used the 77th Percentile Event Day and represents a busier-than-average day. More than three-quarters of all weekdays will produce less traffic, including some days with no Hynes Convention Center impact. The Final Project Impact Report will contain an analysis based on full operation of the reopened Hynes Convention Center.

The projection of the Hynes Convention Center traffic impact is based on information developed five years ago in preparation of the Hynes Auditorium DEIR. Now that the Hynes Convention Center is reopened and approaching full operation, its actual impact can be observed. For preparation of the Final Project Impact Report, actual Hynes Convention Center operations will be reviewed and used as the basis for the projection of background traffic from the Hynes. Changes in No-Build and Build level-of-service analysis presented in the report may result from reanalysis of Hynes Convention Center's impacts.

The anticipated traffic from each background development was added to the existing networks for both peak hours to determine the 1994 No-Build condition. Completed traffic studies and access plans were available for several of the background projects and provided detailed information on projected morning and evening peak hour volumes. Where no traffic information was available, trip generation rates were applied to the proposed building program for each background development to calculate project traffic. The trip generation rates used to generate background development traffic were similar to those used for the 116 Huntington Avenue Project FEIR, EOE #5777 (November 1986). Table III-3 shows the number of entering and exiting peak hour trips generated for the background developments.

To account for background development from 1994 through 1999, the project Full-Build year, an annual growth factor of 0.5 percent was used. The principal approach to establishing a growth rate was to examine past changes in traffic. VHB found that successive counts over a long period of time at the same locations were limited. Comparative counts were generally only available during the period from 1983 to 1988, and often only covered a few of those years. This comparison of available data revealed that while there were volume increases at some locations and decreases at others in the study area, overall there was a small annual volume decrease in the morning peak hour and a slight annual increase in the evening peak hour. In addition, recent Metropolitan Area Planning Council (MAPC) employment projections for Boston were examined. The data revealed that a small annual increase in employment is expected in the Boston area beyond 1990. Based on all the data available, the 1994 No-Build traffic movements at each analysis location were increased by a total of two and one-half percent to reflect background growth from 1994 to 1999.

As with the project trip generation, it was assumed that there would be only minor office-related trips from background developments during the Saturday midday peak hour. Future Saturday retail and residential travel demands for background projects were projected using the same method as for Saturday project travel demands. As with the weekday background trip generation, project-related trips were generated for the 1994 No-Build analysis and a generalized growth rate was used to develop the 1999 No-Build network. To account for growth from 1994 to 1999, a factor of 0.5 percent annually (same as for weekday) was applied.

3.3 Trip Distribution and Assignment

To assess project impacts on study area roadways, the vehicle trips generated by the Prudential Center Redevelopment project and from background developments were distributed over the projected roadway system. This distribution was based primarily on a survey of Prudential Center employees by Cambridge Systematics, Inc. in January 1987. Table III-44 shows the geographic distribution of trips used and Figure III-18 illustrates the assignment of trips to major roadway corridors providing access into and out of the study area.

In addition to determining the distribution of traffic to major routes in and out of the city, alternative local routings were also considered between the major roadways and the site. Of particular concern were the neighborhood streets, which can and often are used by commuter traffic in the study area. Prudential Center Garage turning movement counts conducted for this study in September 1988, Prudential Center Garage parking system data, and the proposed access to and egress from the site were also used to determine how traffic would approach and depart the site.

Travel time runs reported in the Existing Conditions section were also used in determining traffic routes. Travel time runs were recorded over selected alternative routes between Prudential Center Garage entrances and exits and access points to major roadways. The results of these runs determined which routes currently provide the shortest peak hour travel time.

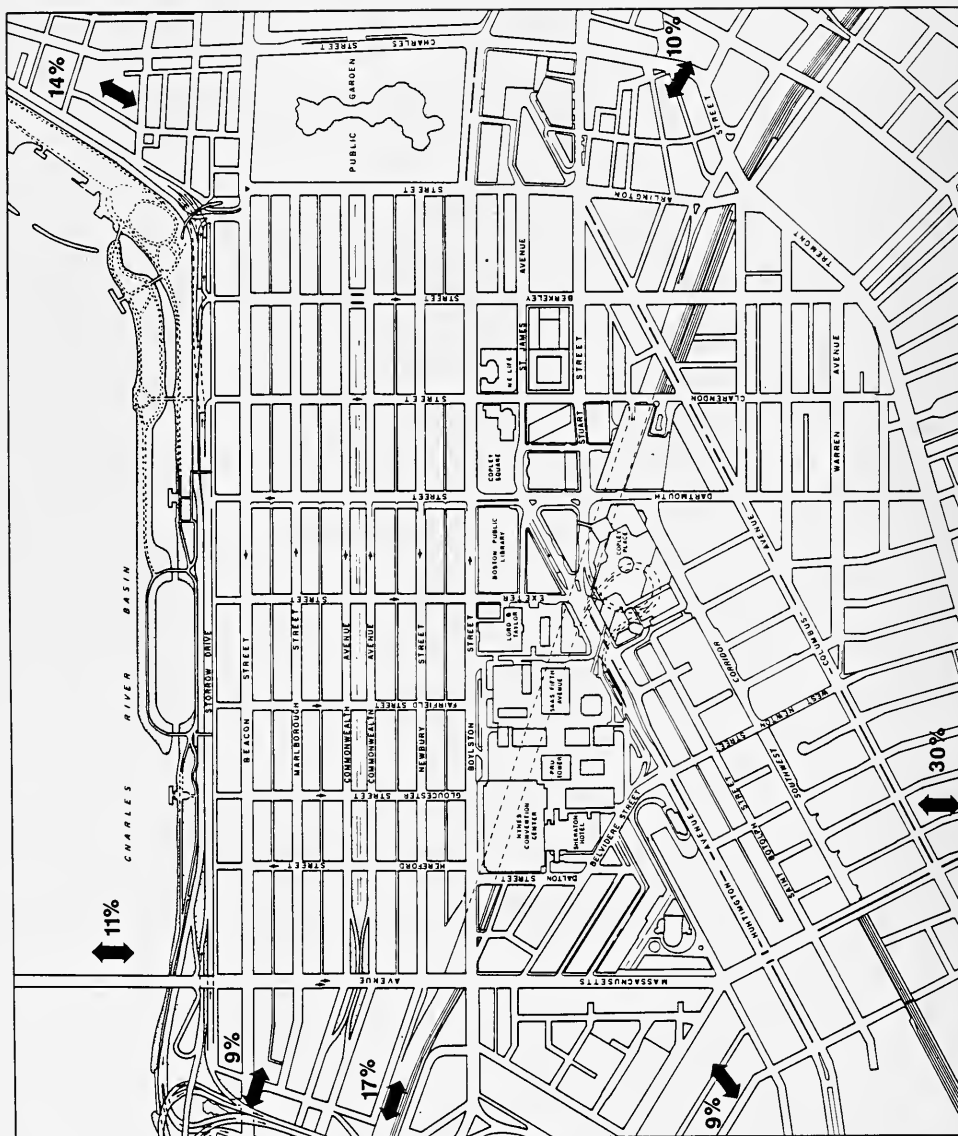
Alternative travel routes considered between major roadways and the Prudential Center Garage include: the Southeast Expressway via Massachusetts Avenue and West Newton Street; alternative routes to Storrow Drive east and west; and alternative routes to the Harvard Bridge on Massachusetts Avenue. These travel time runs were particularly useful in highlighting alternative routes that demonstrated a significant time savings. More specifically, it was found that in the evening West Newton Street is a faster route to reach the Massachusetts Avenue and Columbus Avenue intersection than to travel south on Massachusetts Avenue from Huntington Avenue. Similarly, the fastest route to reach Storrow Drive in the evening is via Boylston Street, Dartmouth Street, Marlborough Street, and Berkeley Street.

Travel time alone is not the determining factor used in assigning traffic to a street system. Consideration is also given to the directness of the route, number of lanes, driver perceptions, and potential growth in traffic. As a result, traffic is distributed among the various routes available with proportionally more traffic assigned to the faster routes.

TABLE III-44
GEOGRAPHIC DISTRIBUTION OF VEHICLE TRIPS

<u>Direction</u>	<u>Percent</u>
Northeast	15%
North	11%
Northwest	6%
West (Local)	3%
West (Massachusetts Turnpike)	17%
Southwest	11%
South	6%
Southeast	31%
 TOTAL	 100%

Source: Prudential Employee Survey; Cambridge Systematics (1987).



The vehicle-trip distribution used for the weekday analysis was also used for the Saturday analysis. Prudential Center Garage data for a Saturday was examined for use in assigning trips to the road system. This data showed that 60 percent of the total entering and exiting volumes was from the North Garage and 40 percent was from the South Garage. Therefore, the trips generated by the project for 1994 and 1999 were assigned to routes in and out of the area as in the morning and evening peak hours with 60 percent percent routed to the North Garage and 40 percent to the South Garage. The additional traffic generated by the redevelopment was added to the existing network and adjusted for the proposed closure of South Ring Road in 1994 and both South and North Ring roads in 1999.

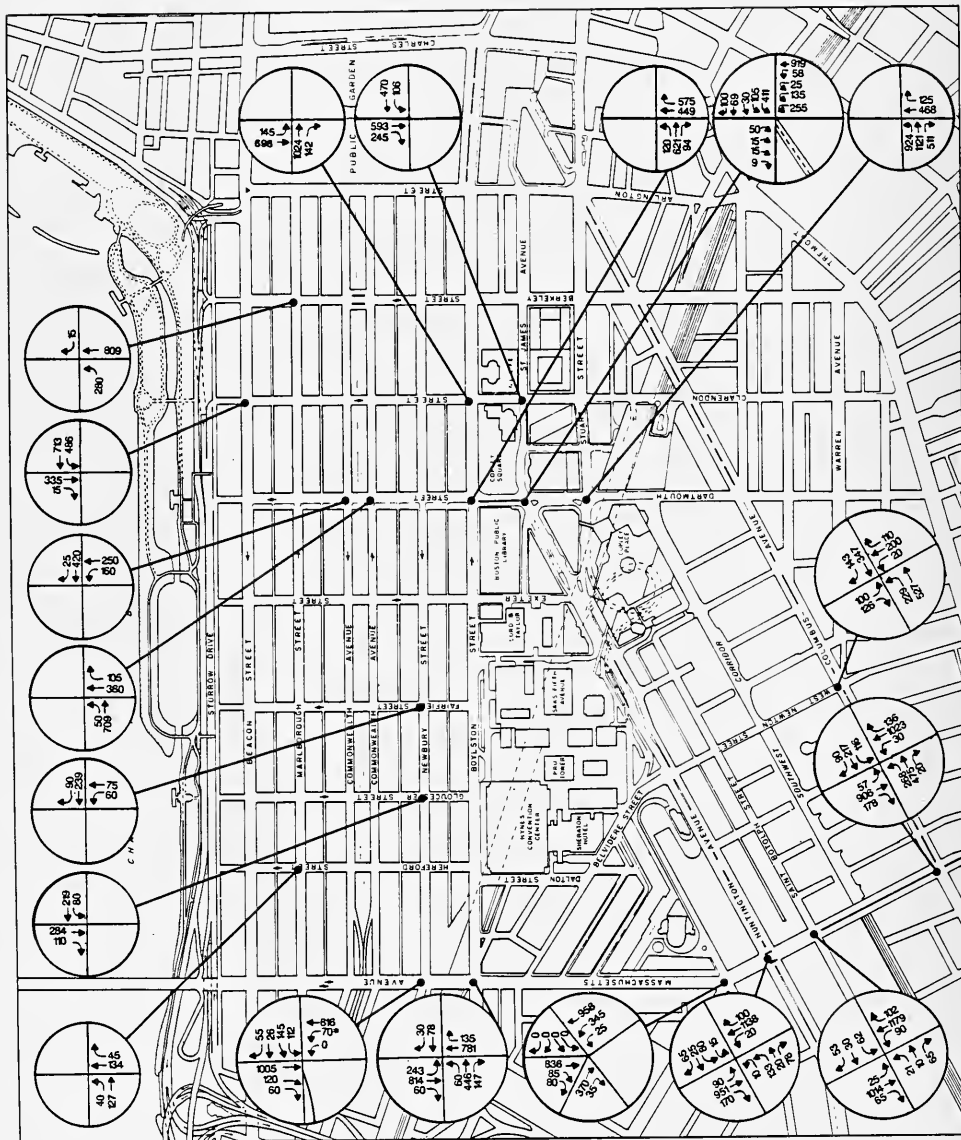
3.4 Traffic Volumes

The analysis of roadway impacts has been conducted for two future condition scenarios, 1994 and 1999. First, the expected traffic increases related to developments other than the Prudential Redevelopment Center have been added to the existing volumes to develop a future No-Build network for both analysis years. Morning, evening, and Saturday 1994 No-Build peak hour volumes are shown in Figures III-19A and III-19B, III-20A and III-20B, and III-21, respectively. Next, the expected traffic increases generated by the project for the 1994 scenario have been added to the 1994 No-Build networks to develop the 1994 Build networks. These are shown in Figures III-22A and III-22B, III-23A and III-23B, and III-24. Morning, evening, and Saturday 1999 No-Build peak hour volumes are shown in Figures III-25A and III-25B, III-26A and III-26B, and III-27, respectively. Figures III-28A and III-28B, III-29A and III-29B, and III-30 show the 1999 Build networks.

Throughout the Boston area, evening peak hour traffic volumes are generally the highest volumes experienced during the day. Similarly, the highest volume projected to be generated by the Prudential Center Redevelopment is expected to occur in the evening peak hour. To illustrate the impact of background traffic and Prudential Center traffic, Table III-45 shows evening peak hour traffic increases on selected study area roadways in 1999. For the project, both mitigated and unmitigated volumes are shown.

Prudential
Center
Redevelopment

Fig. III-19A
1994 No-Build
AM Peak Hour
Traffic Volumes



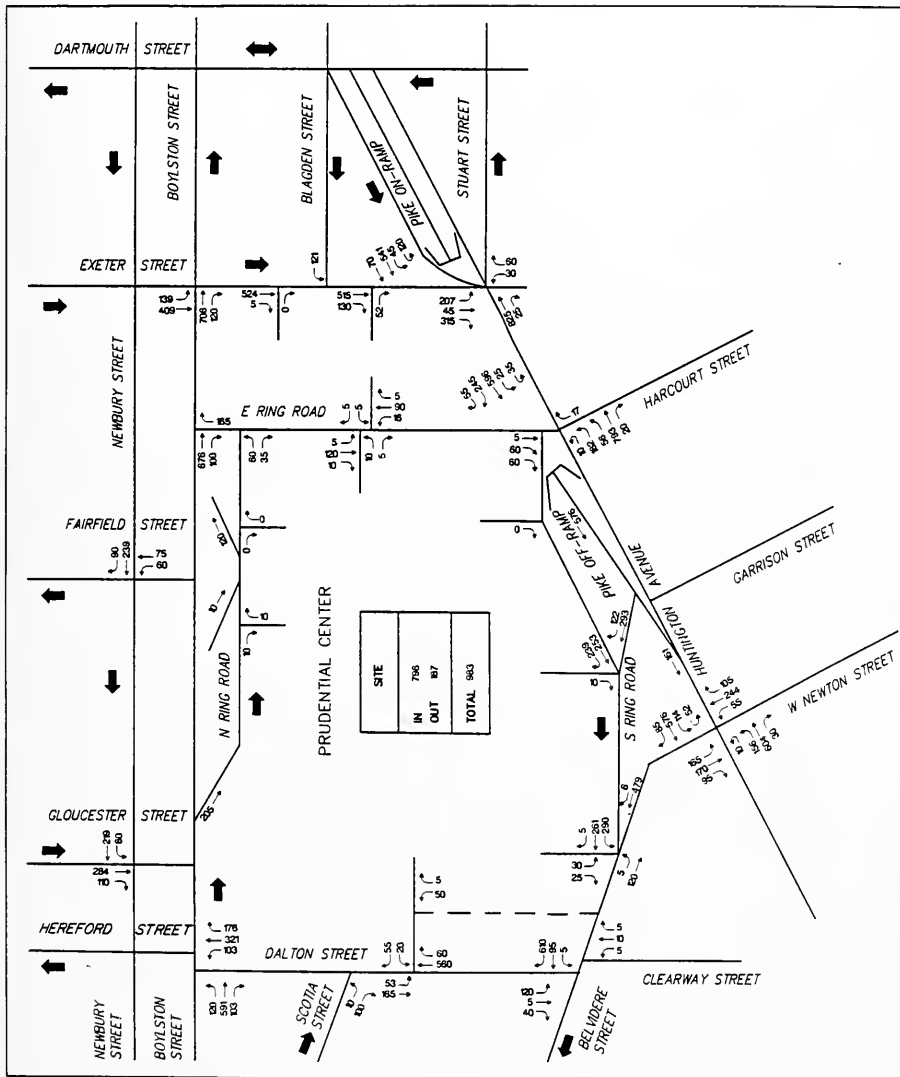
Prudential Center Redevelopment

Fig. III-19B 1994 No-Build AM Peak Hour Traffic Volumes



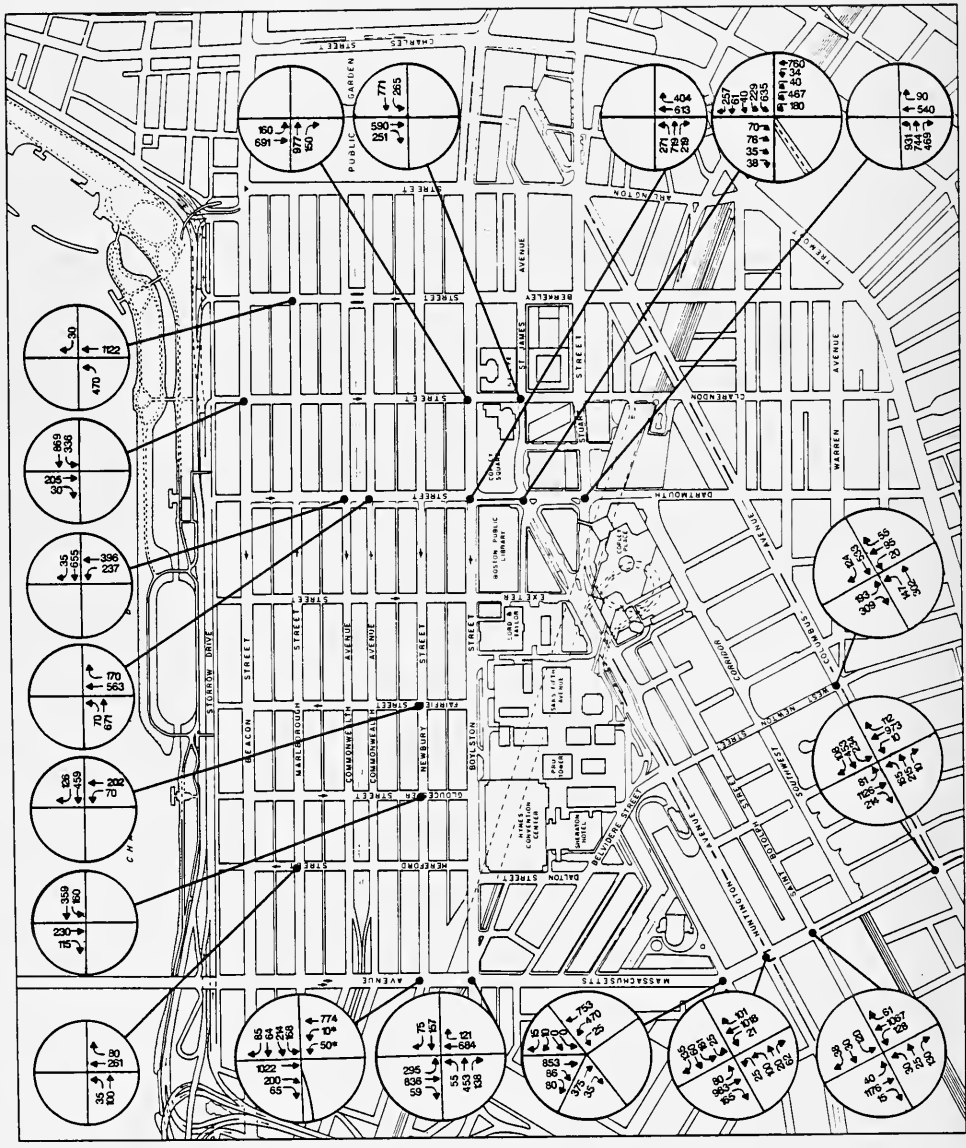
0 200 400
Scale: feet

III-123



Prudential Center Redevelopment

Fig. III-20A 1994 No-Build PM Peak Hour Traffic Volumes



0 200 400
Scale feet

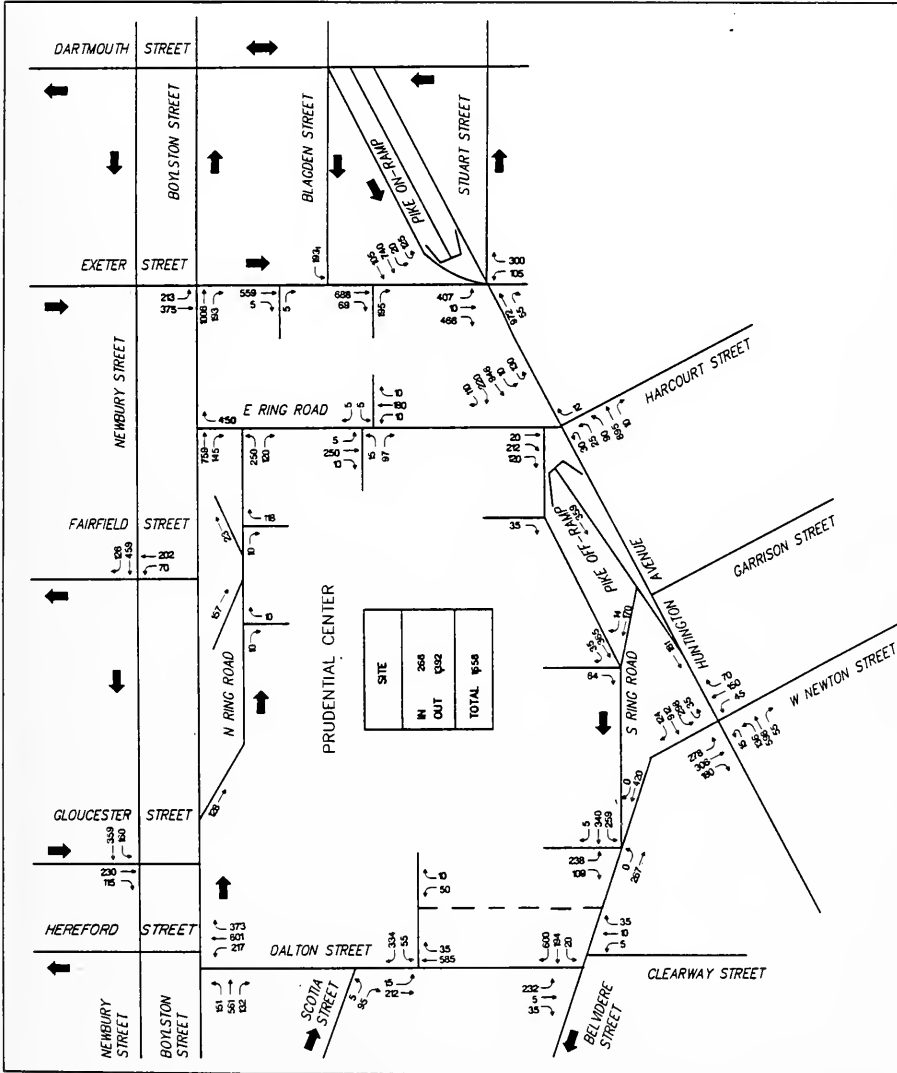


Prudential Center Redevelopment

Fig. III-20B
1994 No-Build
PM Peak Hour
Traffic Volumes



0 200 400
Scale : feet



Prudential Center Redevelopment

Fig. III-21 1994 No-Build Saturday Peak Hour Traffic Volumes

0 200 400
Scale : feet

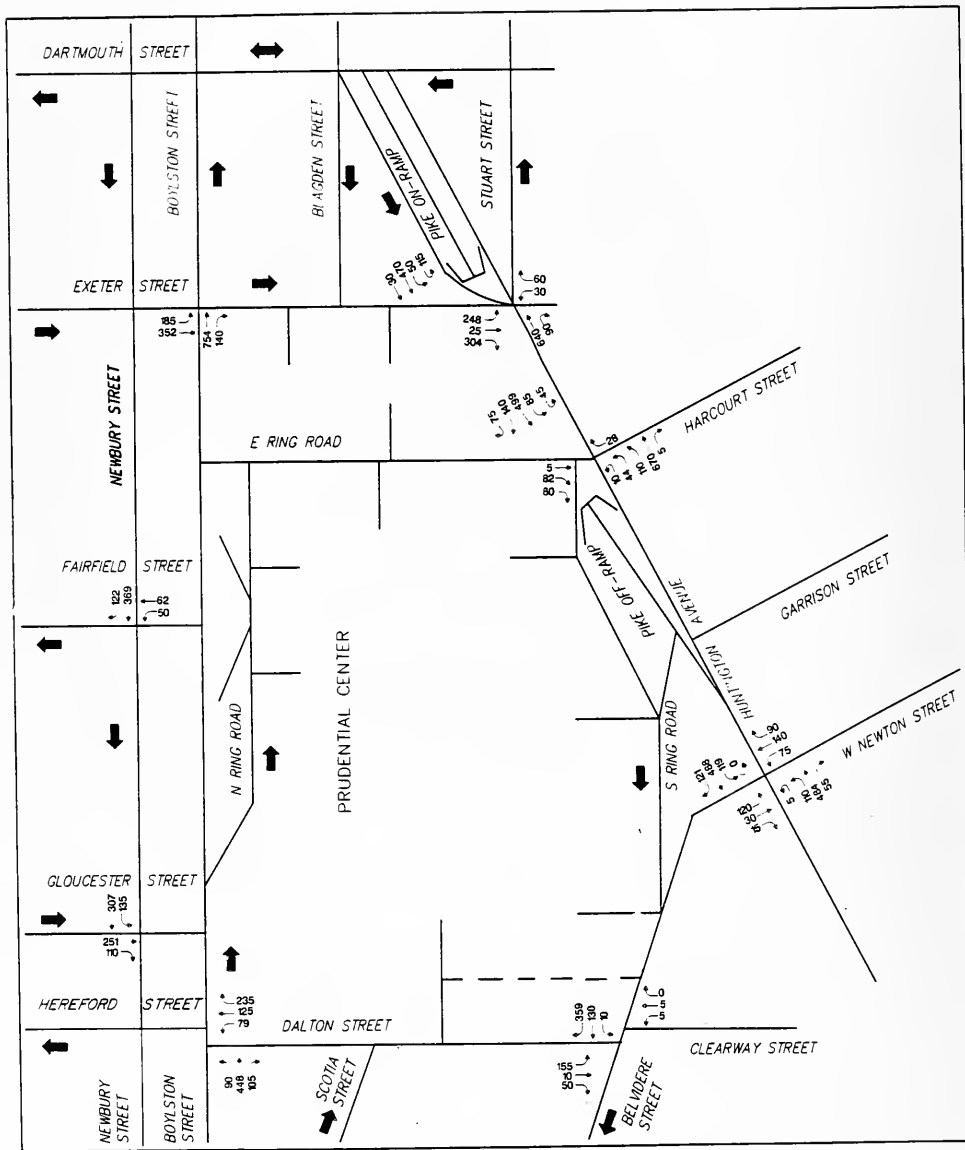
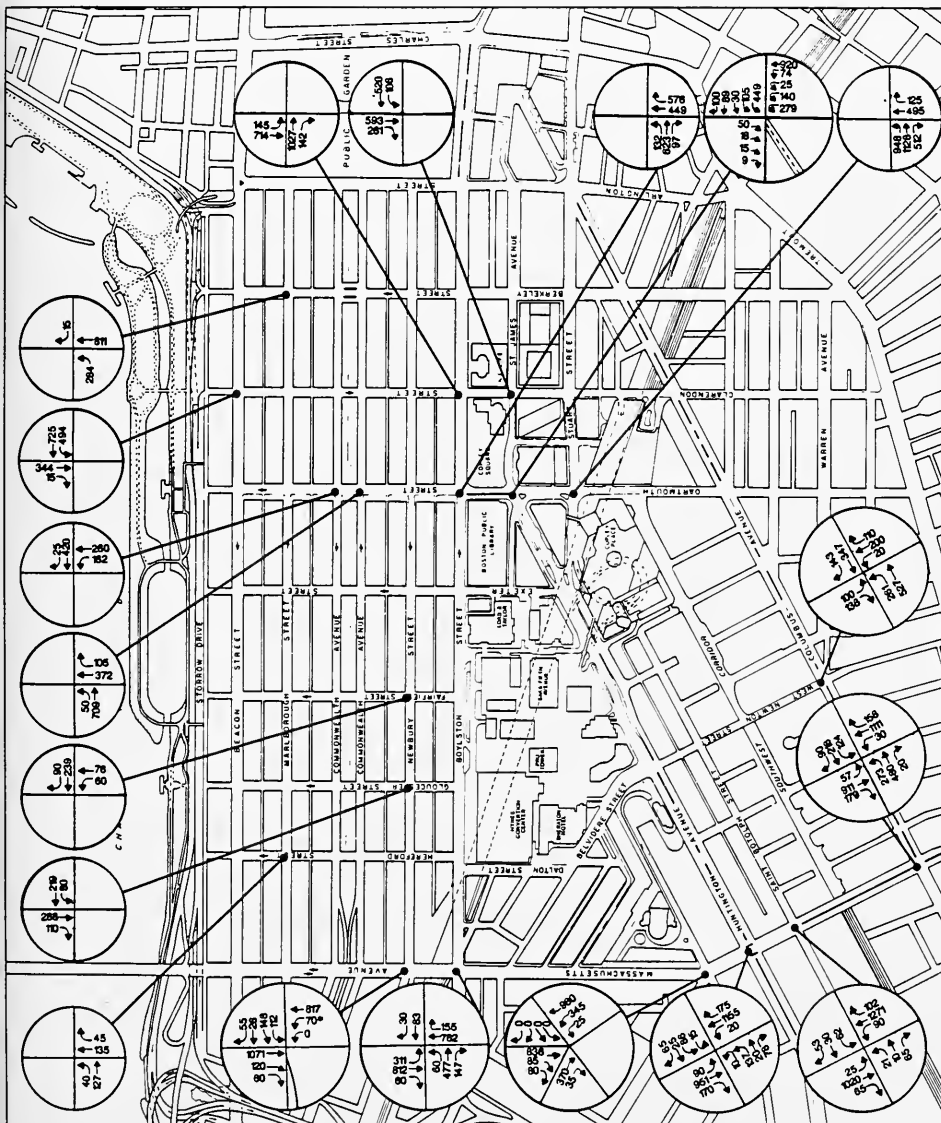


Fig. III-22A
1994 Bull
AM Peak Hour
Traffic Volumes



Prudential Center Redevelopment

Fig. III-22B 1994 Build AM Peak Hour Traffic Volumes

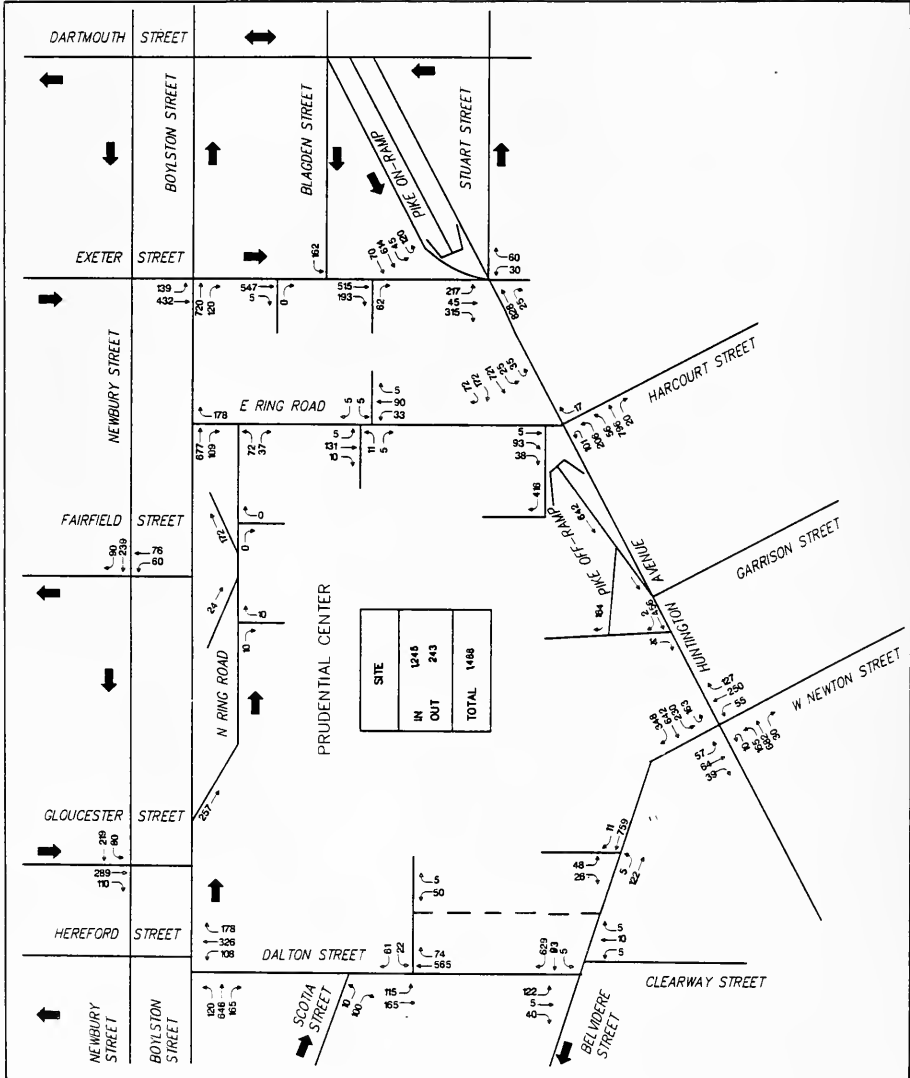
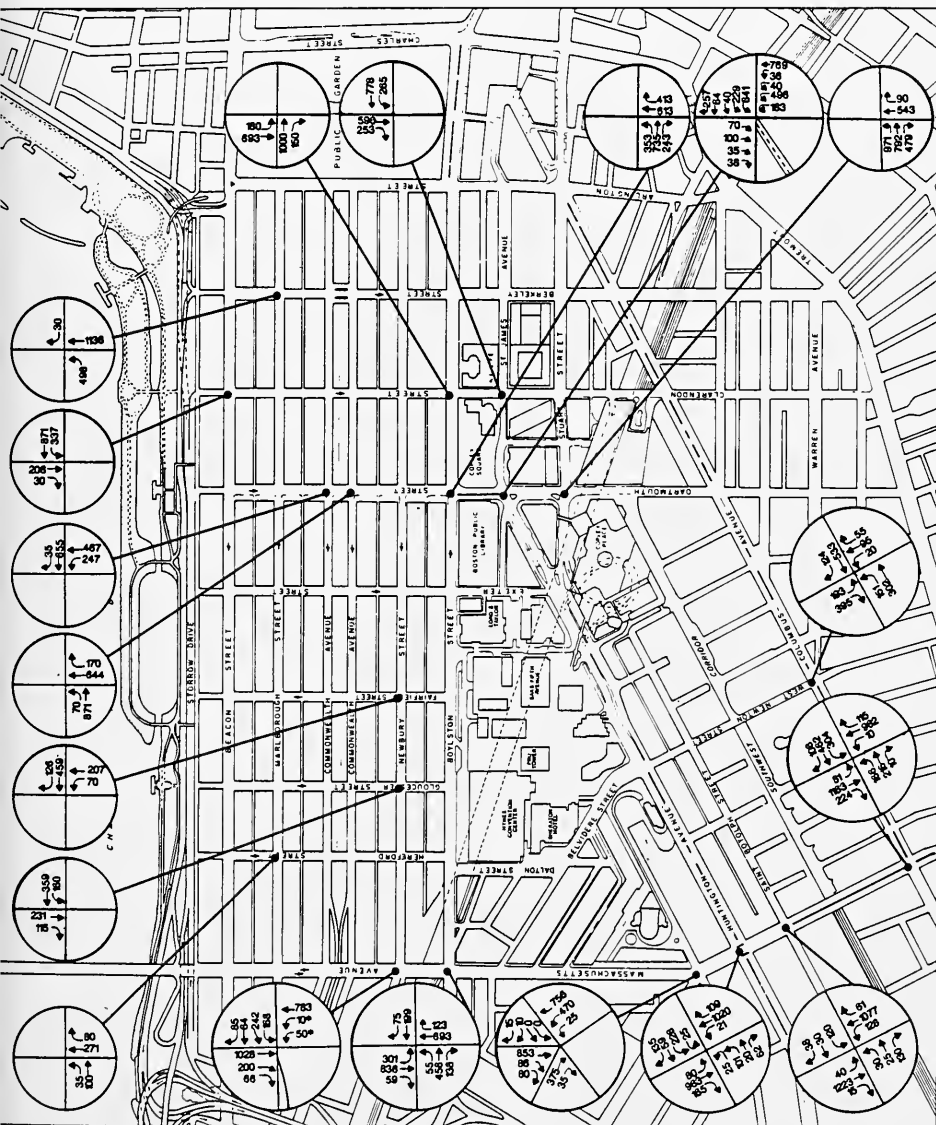


Fig. III-23A
1994 Build
PM Peak Hour
Traffic Volumes



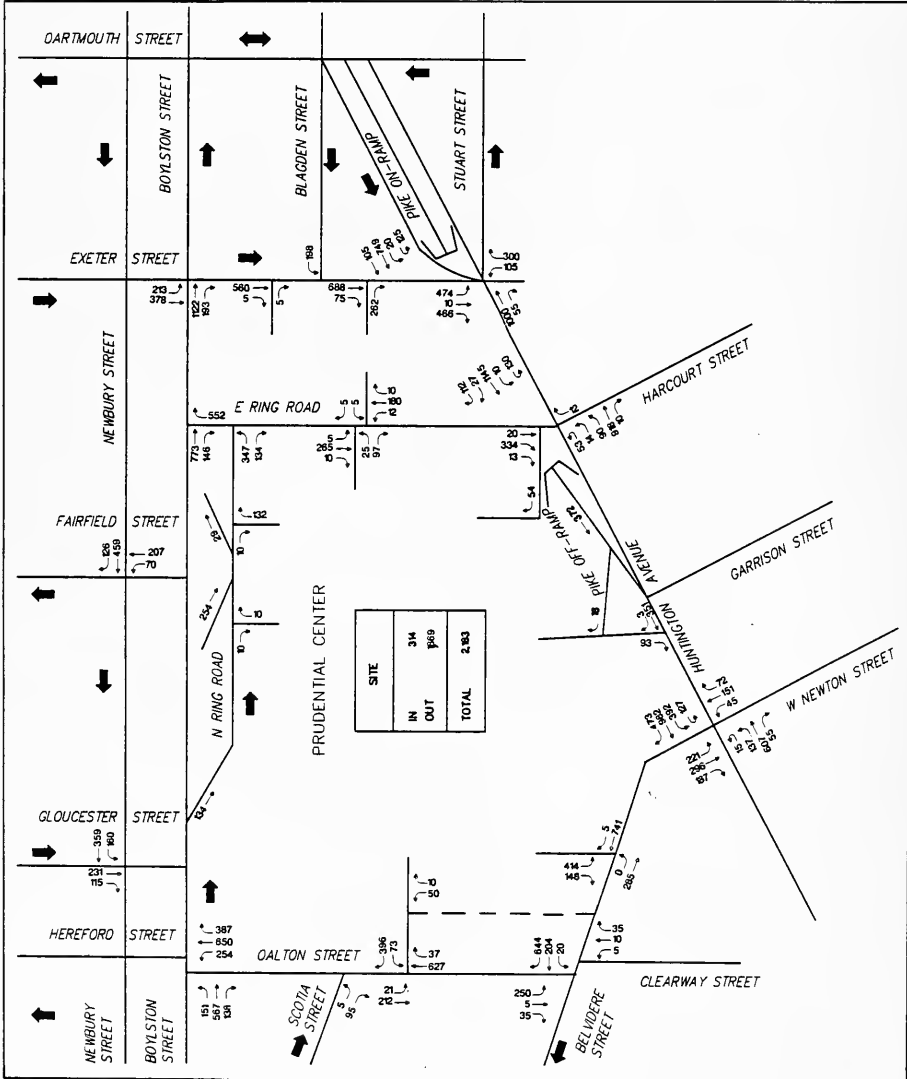
Prudential Center Redevelopment

Fig. III-23B 1994 Build PM Peak Hour Traffic Volumes



0 200 400
Scale : feet

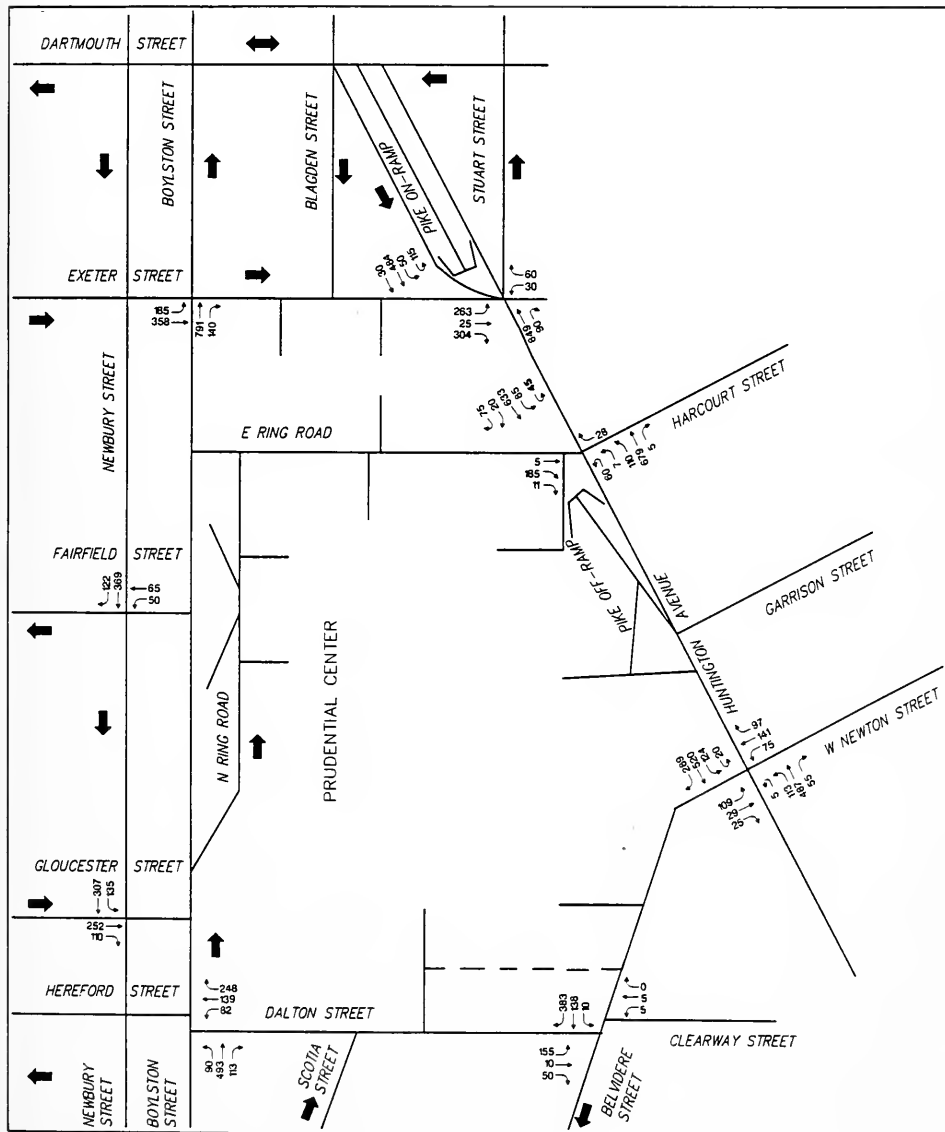
III-130



Prudential Center Redevelopment

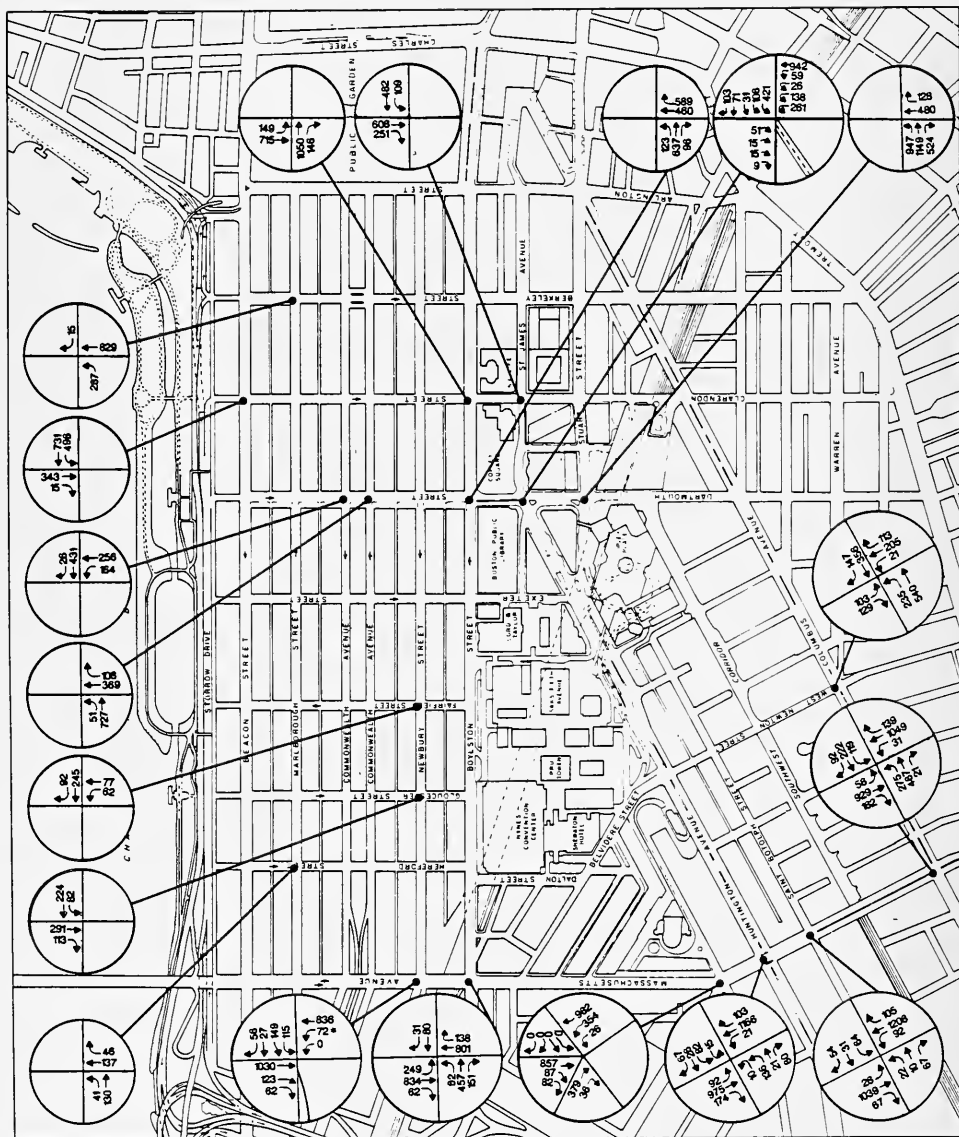
Fig. III-24
1994 Build
Saturday Peak Hour
Traffic Volumes

0 200 400
 Scale : feet



Prudential
Center
Redevelopment

Fig. III-25A
1999 No-Build
AM Peak Hour
Traffic Volumes



Prudential Center Redevelopment

Fig. III-25B 1999 No-Build AM Peak Hour Traffic Volumes



0 200 400
Scale : feet

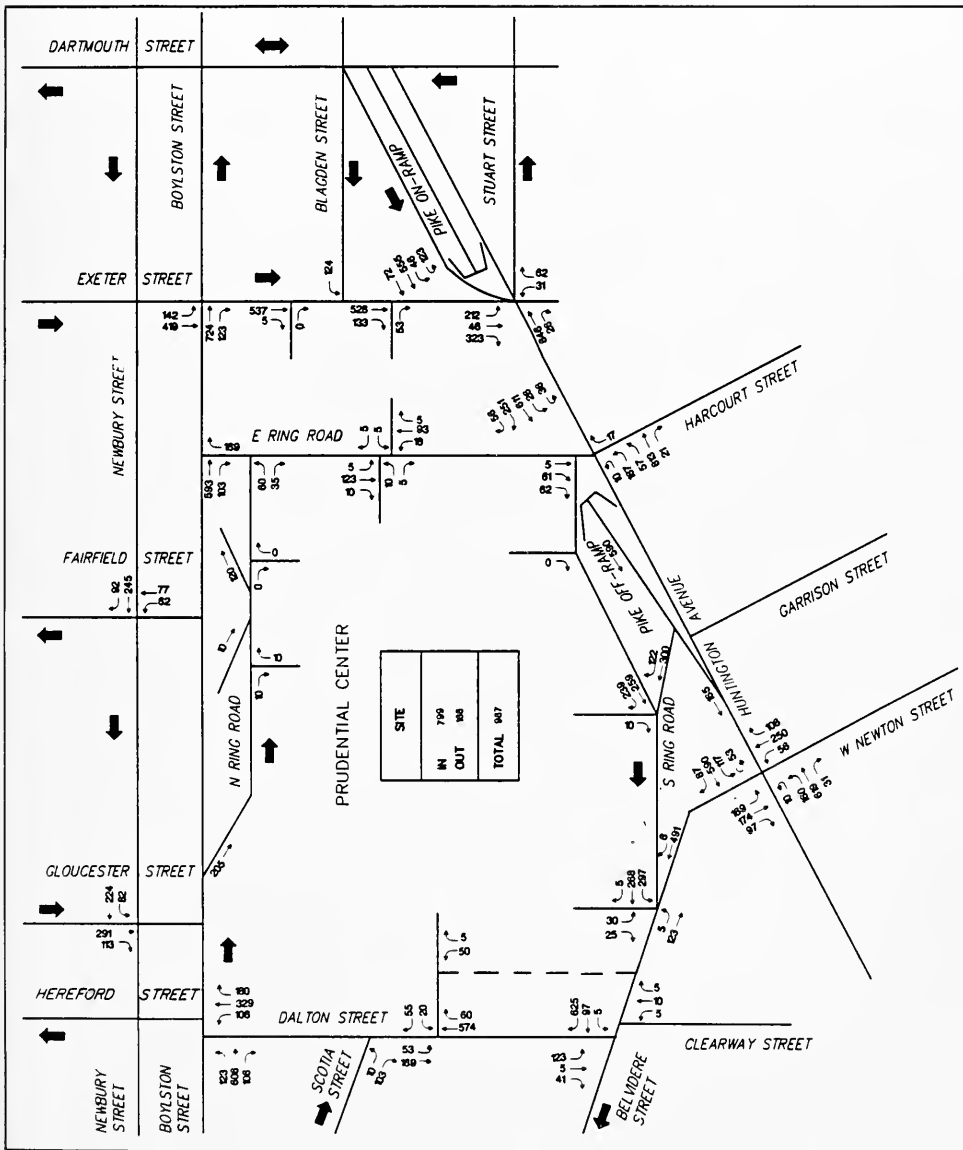
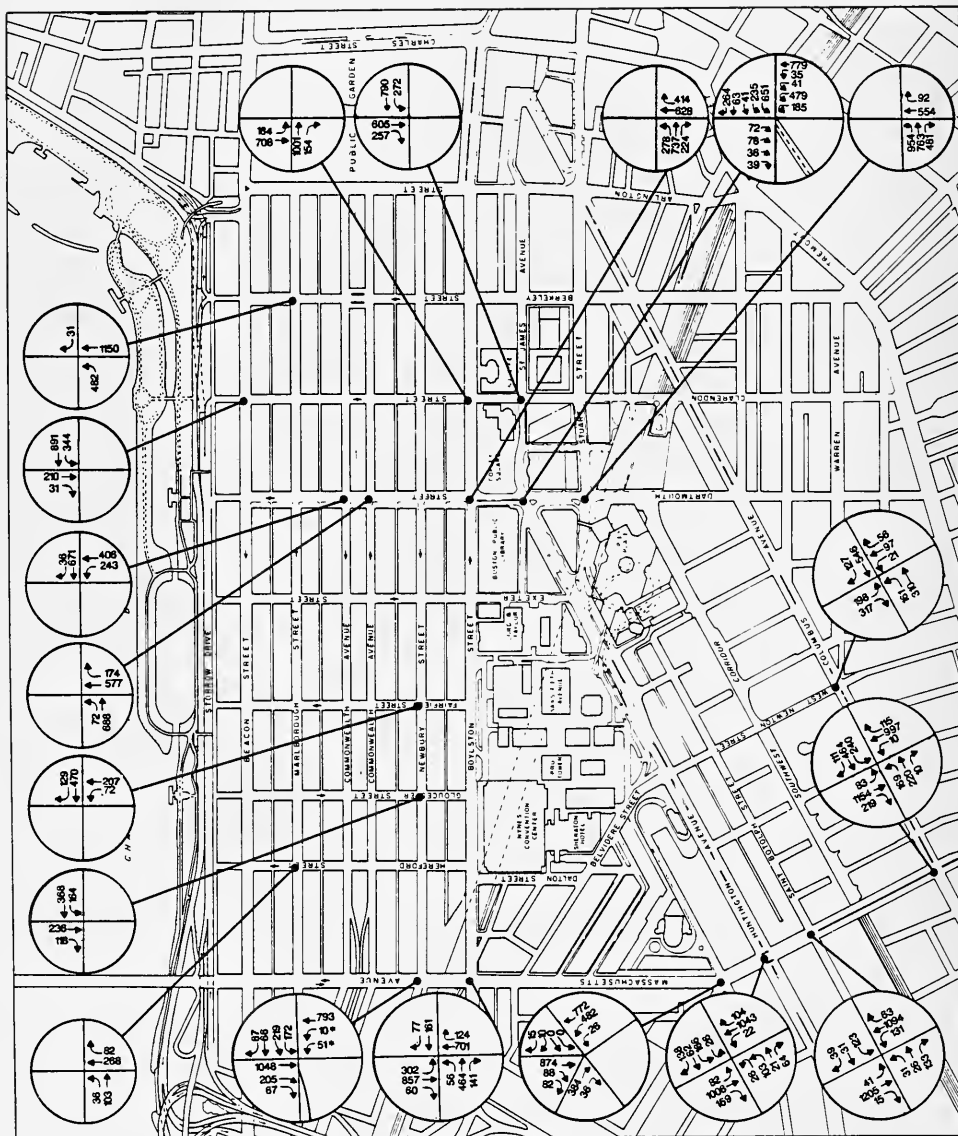


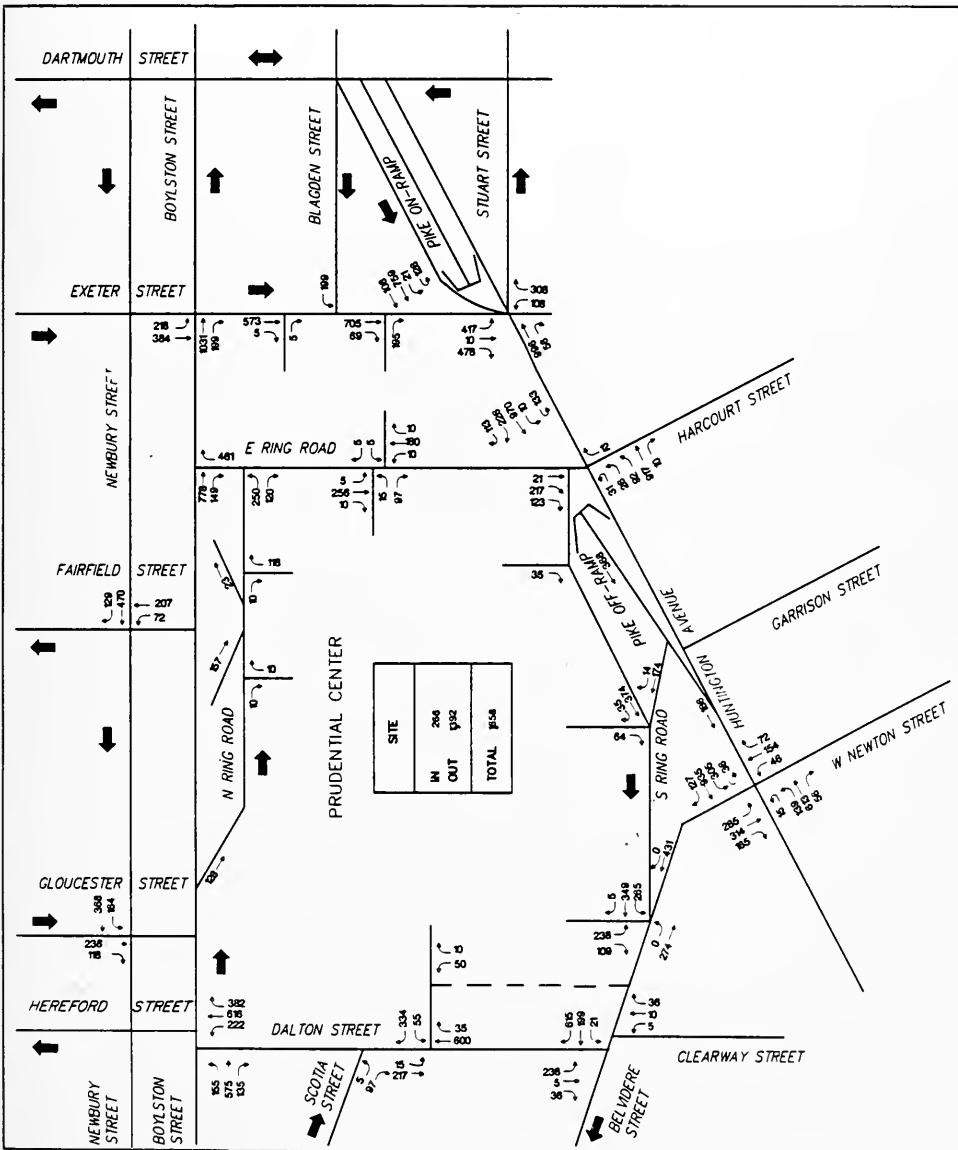
Fig. III-26 A
1999 No-Build
PM Peak Hour
Traffic Volumes



Prudential Center Redevelopment

Fig. III-26B 1999 No-Build PM Peak Hour Traffic Volumes

0 200 400
Scale: feet



Prudential Center Redevelopment

Fig. III-27 1999 No-Build Saturday Peak Hour Traffic Volumes

0 200 400
Scale: feet

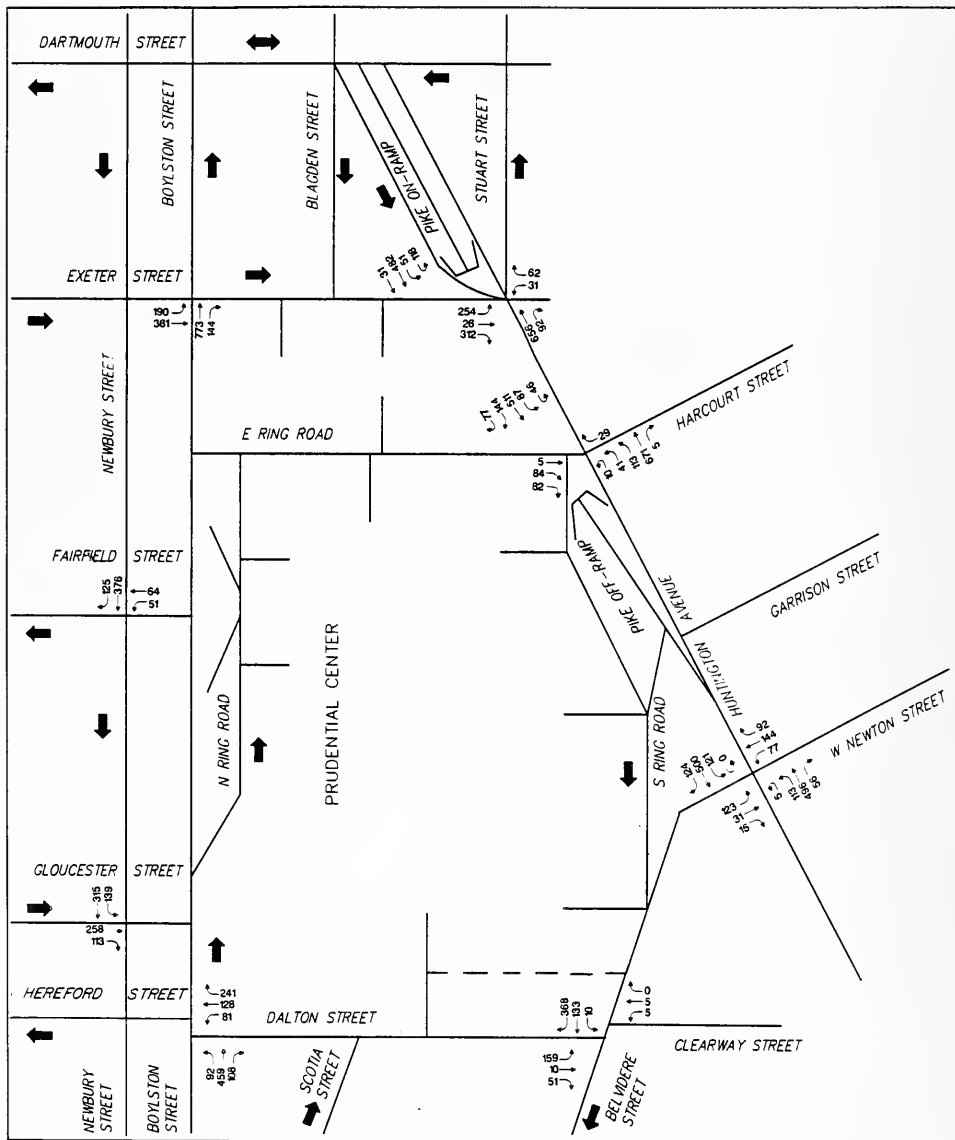
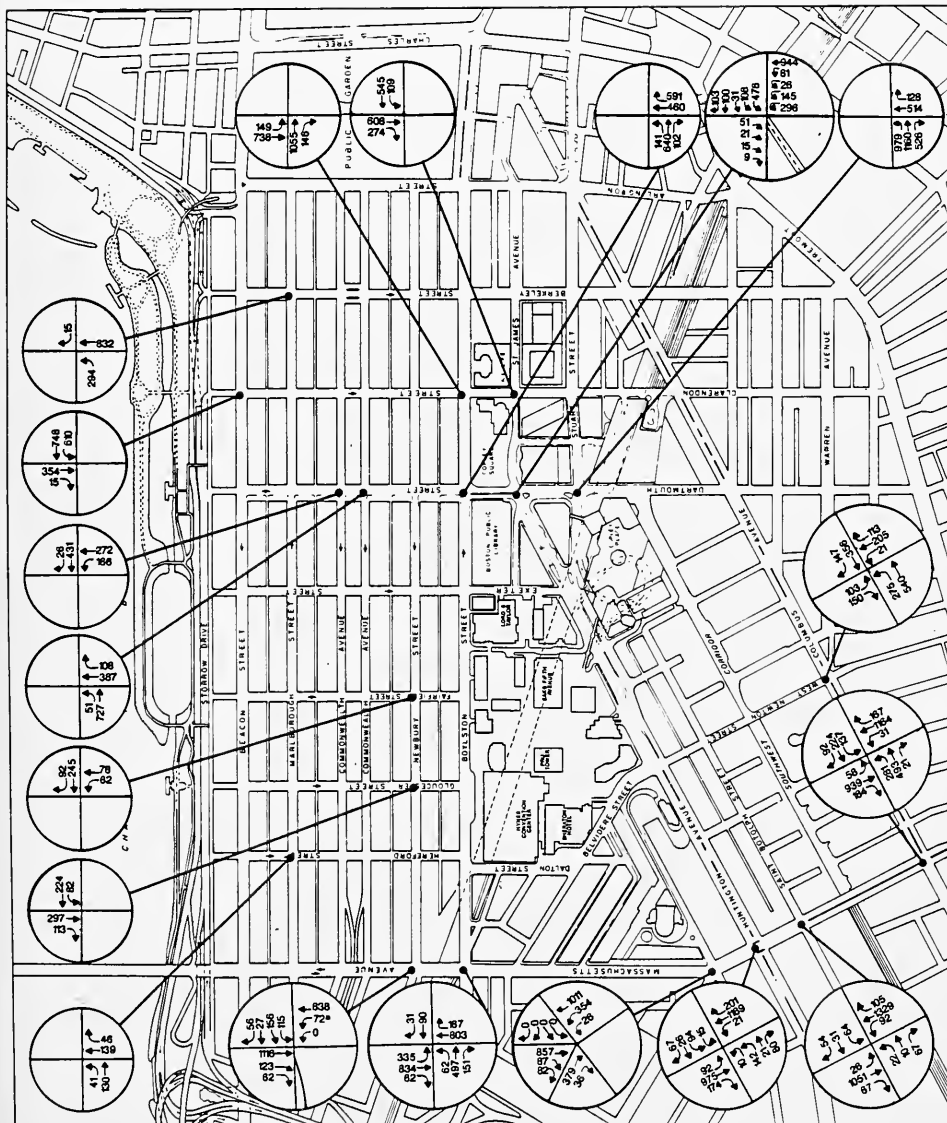


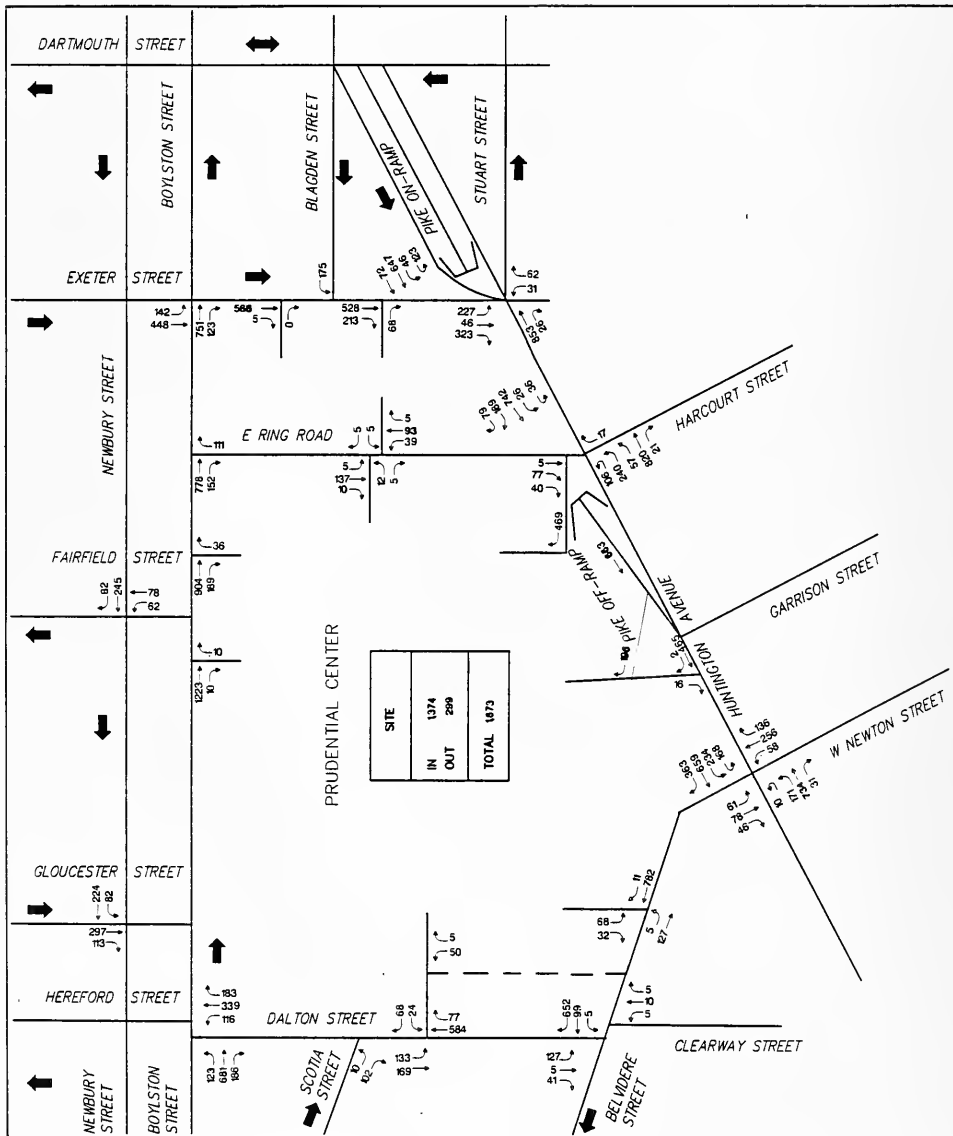
Fig. III-28 A
1999 Build
AM Peak Hour
Traffic Volumes



Prudential Center Redevelopment

Fig. III-28B 1999 Build AM Peak Hour Traffic Volumes

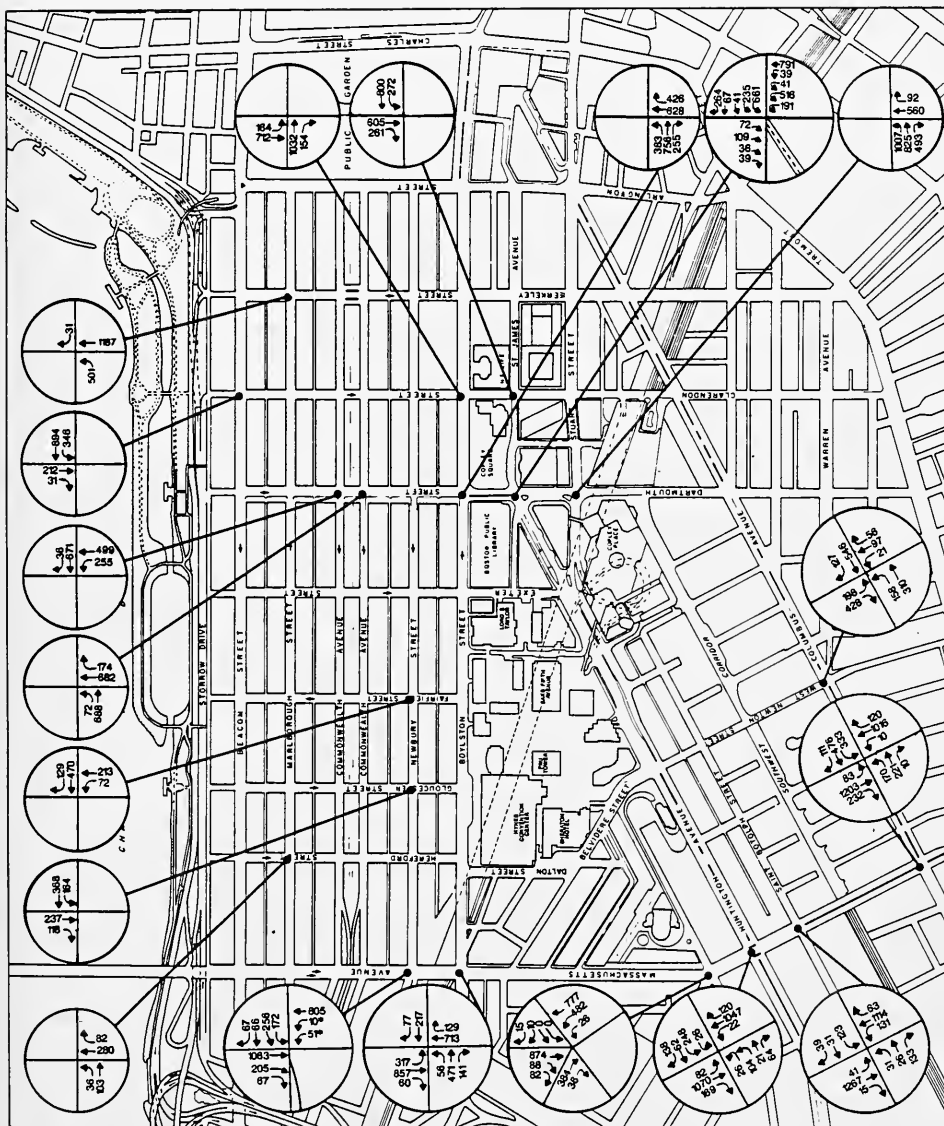
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Scale: feet



Prudential Center Redevelopment

Fig. III-29A 1999 Build PM Peak Hour Traffic Volumes

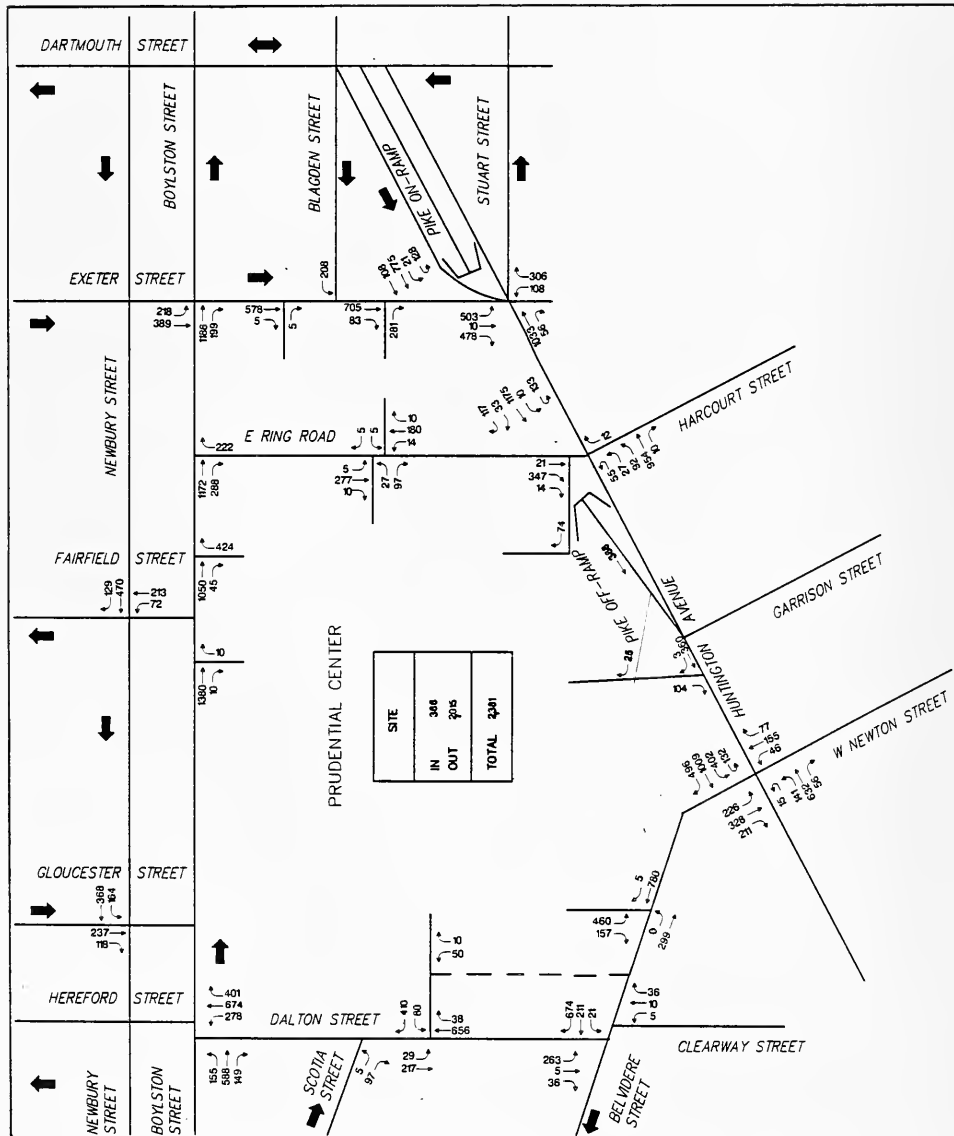
0 200 400
Scale feet



Prudential Center Redevelopment

Fig. III-29B 1999 Build PM Peak Hour Traffic Volumes

0 200 400
Scale : feet



Prudential Center Redevelopment

Fig. III-30
1999 Build
Saturday Peak Hour
Traffic Volumes



0 200 400
Scale: feet

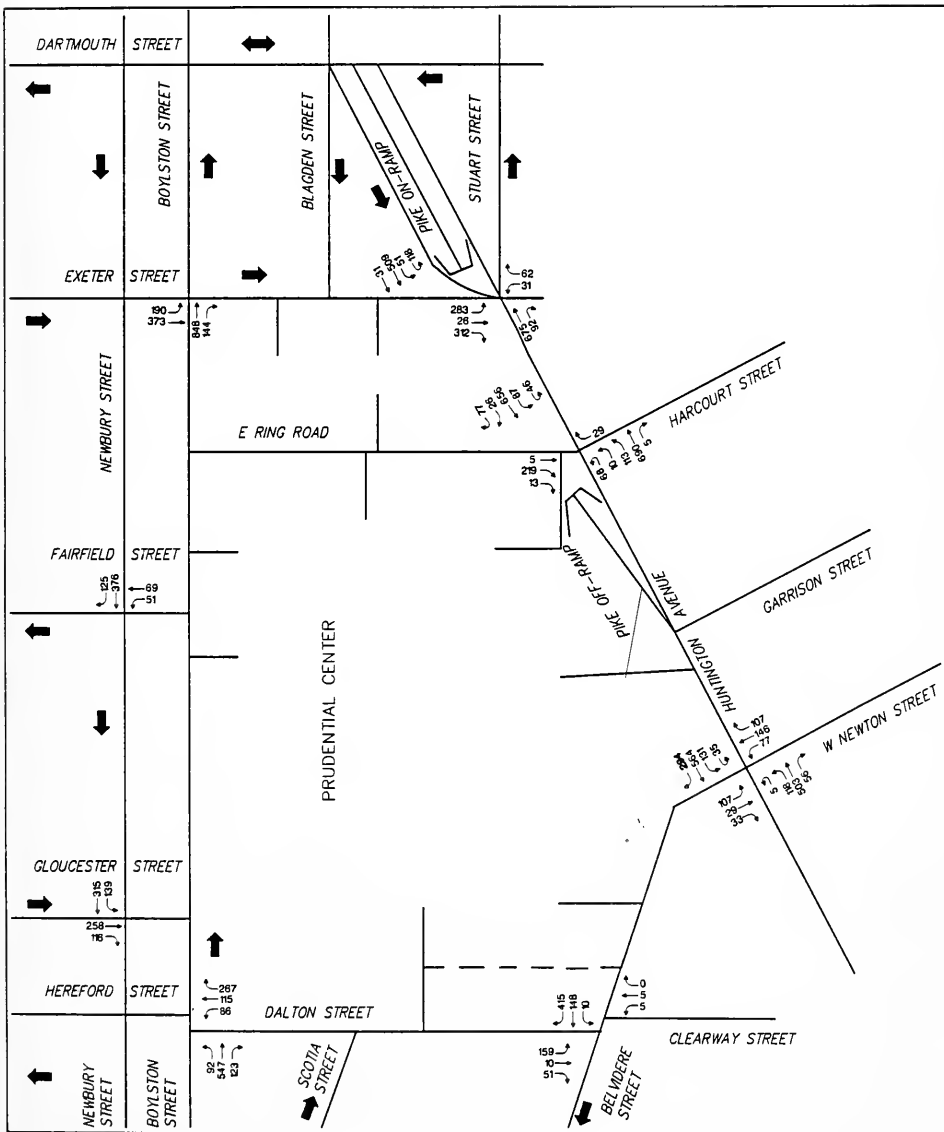


TABLE III-45
1999 EVENING PEAK HOUR TRAFFIC VOLUME INCREASES

Location	Existing Volume	No-Build Volume	Increase from Existing to No-Build	Build Volume		Increase from No-Build to Build	
				Unmitigated	Mitigated	Unmitigated	Mitigated
Boylston Street west of Dartmouth Street	1,075	1,239	164	1,394	1,330	155	91
Stuart Street west of Dartmouth Street	1,915	2,198	283	2,325	2,275	127	77
Huntington Avenue west of Belvidere Street	1,865	2,004	139	2,125	2,083	121	79
West Newton Street north of Columbus Avenue	825	890	65	1,008	963	118	73
Massachusetts Avenue north of Columbus Avenue	2,505	2,733	228	2,815	2,788	82	55
Massachusetts Avenue south of Columbus Avenue	2,280	2,526	246	2,692	2,633	166	107
Boylston Street east of Massachusetts Avenue	1,045	1,128	83	1,211	1,187	83	59
Newbury Street east of Massachusetts Avenue	450	544	94	581	566	37	22
Massachusetts Avenue north of Newbury Street	2,115	2,200	85	2,227	2,221	27	21
Hereford Street south of Marlborough Street	320	350	30	362	357	12	7
Fairfield Street south of Commonwealth Avenue	180	279	99	285	283	6	4
Dartmouth Street south of Commonwealth Avenue	650	751	101	856	814	105	63
Berkeley Street south of Marlborough Street	945	1,150	205	1,187	1,173	37	23
Berkeley Street south of Beacon Street	1,360	1,663	303	1,719	1,696	56	33
Stuart Street east of Dartmouth Street	720	855	135	917	892	62	37
Exeter Street north of Huntington Avenue	710	905	195	991	957	86	52

At Full-Build in 1999, the largest evening peak hour volume increases from the Prudential Center Redevelopment are on Massachusetts Avenue south of Columbus Avenue, where the project adds 166 vehicle trips, and on Boylston Street west of Dartmouth Street, where the development adds 155 vehicle trips. These represent 6.6 and 12.5 percent increases, respectively, over the projected 1999 No-Build volume. Mitigation reduces these increases substantially to 107 and 91 vehicle trips, respectively. The next highest volume is along Stuart Street west of Dartmouth Street, where the development adds 127 vehicle trips, representing a 5.8 percent increase over the 1999 No-Build volume. The mitigated volume of 77 vehicle trips at this location brings only a 3.5 percent increase. Other streets with a significant share of project traffic include West Newton Street, Huntington Avenue, and Dartmouth Street.

As a result of the distribution of project volumes at the locations mentioned above, project impacts at other locations studied are substantially less. Included in these locations are Massachusetts Avenue north of Newbury Street, which is expected to receive only 21 additional vehicle trips with the mitigated program, Berkeley Street south of Marlborough Street, and Fairfield Street south of Newbury Street. The negligible impact on Fairfield Street is the result of moving the North Garage entrance on Boylston Street to a location east of Fairfield Street as requested by the PruPAC.

The table also documents projected increases from background developments. In most cases, background volume increases are larger than project increases. For example, Stuart Street receives 283 vehicle trips from background development compared to 72 vehicle trips from the mitigated project. Massachusetts Avenue receives 246 vehicle trips from background development compared to 107 from the mitigated project.

3.5 Intersection Level-of-Service Analysis

Level-of-service (LOS) analyses were conducted at all study locations under 1994 and 1999 No-Build and Build conditions using the methods described earlier in the Existing Conditions section and in the Appendix. As previously described, level of service is represented on a scale ranging from LOS A at the highest level to LOS F at the lowest level. Intersection level of service

applies to the intersection as a whole; individual approaches may operate at higher or lower levels than the overall intersection. Also, the results reflect conditions resulting from intersection characteristics and do not reflect external impacts on operations.

Table III-46 provides a summary of the number of intersections which currently operate at or would operate at acceptable LOS (A through D) and at deficient LOS (E or F) for existing, No-Build, and Build conditions. A summary is provided for morning, evening, and Saturday peak hours for 1994 and 1999. Figures III-31 and III-32 illustrate the results at each intersection for the five scenarios in the morning and evening weekday peak hours, respectively. The table and figures show that in the morning peak hour, one intersection is expected to become deficient as a result of the 1994 project development. One additional intersection is expected to become deficient between the 1994 Build program and the 1999 Build program. In the evening peak hour, one intersection is expected to become deficient because of 1994 project volumes. One additional intersection is expected to operate at deficient levels because of 1999 project volumes. On Saturday, no changes to level of service are expected at any location under any future scenario. A more detailed discussion of the expected changes follows. Level-of-service results for the morning and evening peak hours for all scenarios are shown in Tables III-47 through III-50.

3.5.1 1994 Levels of Service

Under the 1994 No-Build scenario, two intersections are expected to operate at deficient levels of service (E or F) in the morning peak hour. At one of these locations there is no change from existing conditions, while at the intersection of Belvidere Street and South Ring Road, level of service is expected to deteriorate to E due to the addition of background development traffic. In the 1994 Build condition, South Ring Road will be removed, thus, eliminating the intersection of Belvidere Street and South Ring Road as an analysis location. The addition of project traffic in the 1994 Build condition is expected to decrease two locations to LOS E. These intersections are Huntington Avenue, West Newton Street, and Belvidere Street; and Columbus Avenue and West Newton Street. At the remaining twenty-five locations, level of service is expected to remain acceptable in the 1994 Build scenario.

TABLE III-46
SUMMARY OF TRAFFIC ANALYSIS RESULTS
ALTERNATIVE A

Analysis Condition	Number of Weekday Locations	Weekday				Number of Saturday Locations	Saturday	
		Morning		Evening			LOS A-D	LOS E-F
		LOS A-D*	LOS E-F	LOS A-D	LOS E-F			
Existing	29	28	1	27	2	8	0	
1994 No-Build	29	27	2	24	5	8	0	
1994 Build	28**	25	3	22	6	8	0	
1999 No-Build	29	27	2	23	6	8	0	
1999 Build	28**	24	4	21	7	8	0	

* LOS is for an intersection as a whole; specific approaches may operate at a higher or lower level of service.

** Number of locations declines because of proposed closure of South Ring Road.

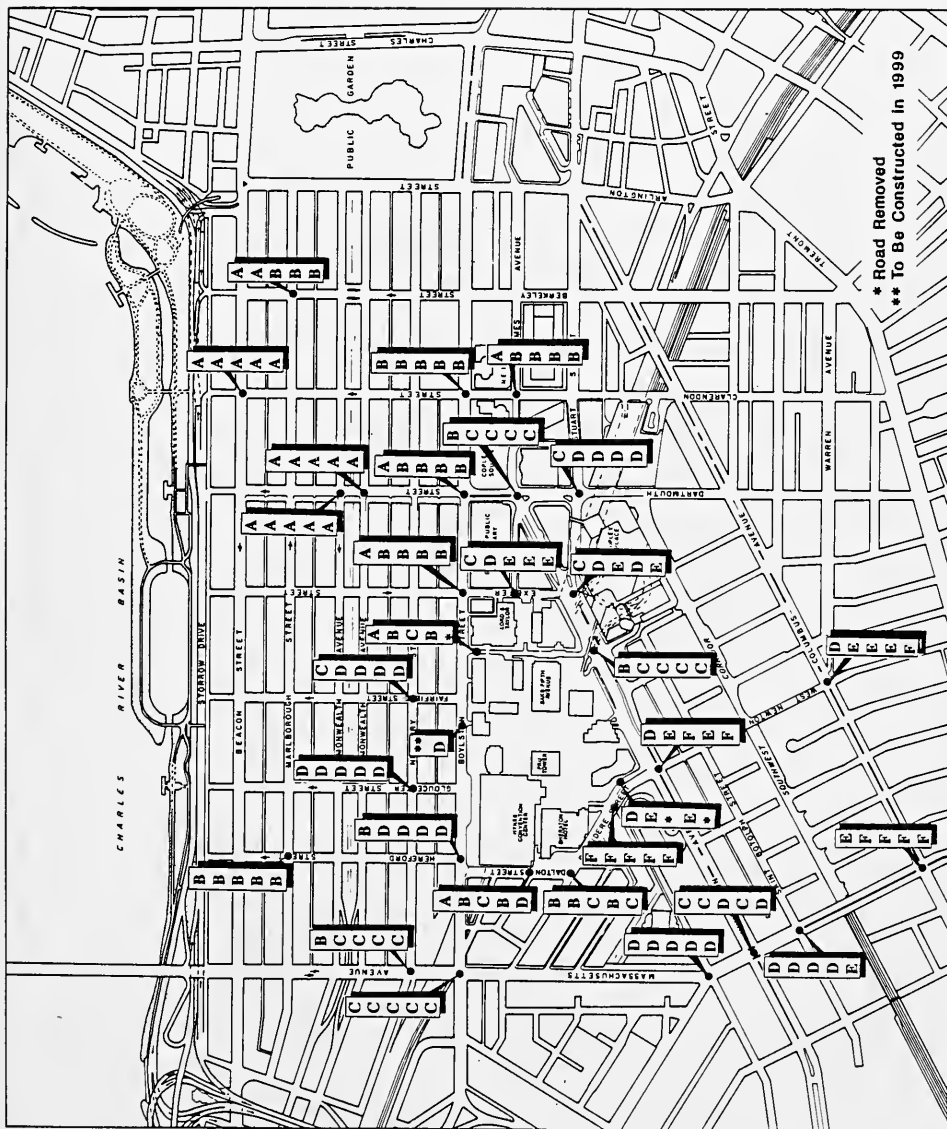
Prudential Center Redevelopment

Fig. III-32 PM Weekday Level of Service Summary

LEGEND:

- | | |
|---|-----------------|
| 1 | = Existing |
| 2 | = No-Build 1994 |
| 3 | = Build 1994 |
| 4 | = No-Build 1999 |
| 5 | = Build 1999 |

0 200 400
Scale : feet



MORNING PEAK HOUR SIGNALIZED INTERSECTION
LEVEL-OF-SERVICE SUMMARY

Location Number	Description	Existing V/C*	Existing LOS**	1994				1999			
				No-Build		Build		No-Build		Build	
				V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS
1	Boylston St. and Clarendon St.	0.61	B	0.64	B	0.64	B	0.64	B	0.66	B
2	St. James Ave. and Clarendon St.	0.44	A	0.47	A	0.49	A	0.48	A	0.51	A
3	Boylston St. and Dartmouth St.	0.60	B	0.61	B	0.62	B	0.63	B	0.63	B
4	Huntington Ave., Dartmouth St., St. James Ave., and Bladgen St.	0.45	A	0.46	A	0.46	A	0.48	A	0.50	A
5	Stuart St. and Dartmouth St.	0.68	B	0.70	C	0.71	C	0.72	C	0.74	C
6	Boylston St. and Exeter St.	0.49	A	0.51	A	0.52	A	0.52	A	0.53	A
7	Huntington Ave., Exeter St., and Stuart St.	0.56	A	0.57	A	0.57	A	0.59	A	0.59	A
8	Huntington Ave., East Ring Rd., and Harcourt St.	0.63	B	0.63	B	0.65	B	0.64	B	0.67	B
9	Huntington Ave., West Newton St., and Belvidere St.	0.68	B	0.70	C	0.91	E	0.72	C	0.95	E
10	Columbus Ave. and West Newton St.	0.84	D	0.86	D	0.90	E	0.89	D	0.93	E
11	Massachusetts Ave. and Columbus Ave.	0.85	D	0.87	D	0.88	D	0.89	D	0.90	E
12	Massachusetts Ave. and Huntington Ave.	0.71	C	0.72	C	0.73	C	0.74	C	0.81	D
13	Massachusetts Ave., Westland Ave., and St. Stephen St.	0.91	E	0.93	E	0.94	E	0.95	E	0.97	E
14	Massachusetts Ave. and Boylston St.	0.61	B	0.68	B	0.76	C	0.70	C	0.79	C
15	Massachusetts Ave. and Newbury St.	0.60	B	0.62	B	0.64	B	0.63	B	0.66	B
16	Boylston St., Dalton St., and Hereford St.	0.50	A	0.55	A	0.57	A	0.56	A	0.60	A
19	Massachusetts Ave. and St. Botolph St.	0.67	B	0.70	C	0.73	C	0.72	C	0.75	C
21	Dartmouth St. and Commonwealth Ave.										
	North	0.30	A	0.30	A	0.30	A	0.30	A	0.31	A
	South	0.42	A	0.43	A	0.43	A	0.44	A	0.44	A
23	Berkeley St. and Marlborough St.	0.40	A	0.40	A	0.40	A	0.41	A	0.41	A
24	Beacon St. and Clarendon St.	0.40	A	0.46	A	0.47	A	0.48	A	0.49	A

* Volume-to-capacity ratio.

TABLE III-48
MORNING PEAK HOUR UNSIGNALIZED INTERSECTION
LEVEL-OF-SERVICE SUMMARY

Location Number	Description	Existing ARC*	LOS**	1994				1999			
				No-Build		Build		No-Build		Build	
				ARC	LOS	ARC	LOS	ARC	LOS	ARC	LOS
17	Newbury St. and Gloucester St.	301	B	282	C	276	C	262	C	256	C
18	Newbury St. and Fairfield St.	574	A	566	A	565	A	555	A	554	A
20	Belvidere St. and Dalton St.	596	A	589	A	575	A	575	A	559	A
22	Hereford St. and Marlborough St.	565	A	554	A	553	A	545	A	543	A
Garage Access Locations											
25	Belvidere St. and Garage	316	B	309	B	237	C	298	C	193	D
25	Belvidere St. and South Ring Rd.	101	D	95	E	***	***	79	E	***	***
26	Dalton St. and Sootia St.	589	A	570	A	497	A	557	A	468	A
27	Exeter St. and Blagden St.	508	A	440	A	395	B	426	A	370	B
28	North Ring Rd. and East Ring Rd.	705	A	705	A	679	A	699	A	***	***
29	Boylston St. and Garage	-	-	-	-	-	-	-	-	614	A

* Available reserve capacity in vehicles per hour.

** Level-of-service.

*** Road removed during development.

TABLE IJL-49
EVENING PEAK HOUR SIGNALIZED INTERSECTION
LEVEL-OF-SERVICE SUMMARY

Location Number	Description	Existing				1994				1999			
		V/C*		LOS**		No-Build		Build		No-Build		Build	
		V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS
1	Boylston St. and Clarendon St.	0.61	B	0.63	B	0.64	B	0.64	B	0.64	B	0.65	B
2	St. James Ave. and Clarendon St.	0.56	A	0.65	B	0.66	B	0.67	B	0.67	B	0.67	B
3	Boylston St. and Dartmouth St.	0.56	A	0.60	B	0.63	B	0.61	B	0.65	B	0.65	B
4	Huntington Ave., Dartmouth St., St. James Ave., and Bladgen St.	0.62	B	0.70	C	0.72	C	0.72	C	0.72	C	0.74	C
5	Stuart St. and Dartmouth St.	0.78	C	0.82	D	0.83	D	0.83	D	0.83	D	0.85	D
6	Boylston St. and Exeter St.	0.57	A	0.63	B	0.66	B	0.65	B	0.69	B	0.69	B
7	Huntington Ave., Exeter St., and Stuart St.	0.74	C	0.86	D	0.91	E	0.88	D	0.94	E	0.94	E
8	Huntington Ave., East Ring Rd., and Harcourt St.	0.69	B	0.71	C	0.72	C	0.72	C	0.74	C	0.74	C
9	Huntington Ave., West Newton St., and Belvidere St.	0.82	D	0.90	E	1.00	F	0.93	E	1.04	F	1.04	F
10	Columbus Ave. and West Newton St.	0.87	D	0.93	E	0.99	E	0.95	E	1.02	F	1.02	F
11	Massachusetts Ave. and Columbus Ave.	0.93	E	1.01	F	1.05	F	1.04	F	1.09	F	1.09	F
12	Massachusetts Ave. and Huntington Ave.	0.72	C	0.77	C	0.80	D	0.79	C	0.83	D	0.83	D
13	Massachusetts Ave., Westland Ave., and St. Stephen St.	0.85	D	0.85	D	0.85	D	0.87	D	0.87	D	0.87	D
14	Massachusetts Ave. and Boylston St.	0.70	C	0.71	C	0.71	C	0.73	C	0.73	C	0.73	C
15	Massachusetts Ave. and Newbury St.	0.69	B	0.73	C	0.75	C	0.76	C	0.77	C	0.77	C
16	Boylston St., Dalton St., and Hereford St.	0.60	B	0.80	D	0.84	D	0.82	D	0.87	D	0.87	D
19	Massachusetts Ave. and St. Botolph St.	0.81	D	0.87	D	0.87	D	0.89	D	0.99	E	0.99	E
21	Dartmouth St. and Commonwealth Ave. North South	0.43 0.48	A A	0.46 0.51	A A	0.48 0.54	A A	0.47 0.53	A A	0.50 0.56	A A	0.50 0.56	A A
23	Berkeley St. and Marlborough St.	0.49	A	0.59	A	0.60	B	0.60	B	0.62	B	0.62	B
24	Beacon St. and Clarendon St.	0.36	A	0.36	A	0.36	A	0.37	A	0.37	A	0.37	A

* Volume-to-capacity ratio.

** Level-of-service.

TABLE III-50
EVENING PEAK HOUR UNSIGNALIZED INTERSECTION
LEVEL-OF-SERVICE SUMMARY

Location Number	Description	Existing ARC*	LOS**	1994				1999			
				No-Build		Build		No-Build		Build	
				ARC	LOS	ARC	LOS	ARC	LOS	ARC	LOS
17	Newbury St. and Gloucester St.	148	D	145	D	144	D	124	D	122	D
18	Newbury St. and Fairfield St.	241	C	132	D	126	D	114	D	107	D
20	Belvidere St. and Dalton St.	366	B	342	B	299	C	323	B	267	C
22	Hereford St. and Marlborough St.	386	B	363	B	351	B	351	B	337	B
<u>Garage Access Locations</u>											
25	Belvidere St. and Garage	-13	F***	-72	F	-310	F	-82	F	-386	F
25	Belvidere St. and South Ring Rd.	110	D***	40	E	^	^	26	E	^	^
26	Dalton St. and Scotia St.	499	A	358	B	205	C	346	B	155	D
27	Exeter St., Blagden St., and Garage	263	C	113	D	67	E	99	E	38	E
28	North Ring Rd. and East Ring Rd.	507	A	376	B	225	C	373	B	^	^
29	Boylston St. and Garage	--	-	--	-	-	-	-	-	171	D

* Available reserve capacity in vehicles per hour.

** Level-of-service.

*** Level of service improved by traffic officer control.

^ Road removed during development.

In the evening peak hour, five intersections are expected to operate at LOS E or F under 1994 No-Build conditions. The addition of background development traffic is expected to cause the following intersections to deteriorate to LOS E: Huntington Avenue, West Newton Street, and Belvidere Street; Columbus Avenue and West Newton Street; and Belvidere Street and South Ring Road. The level of service at Belvidere Street and South Ring Road can be maintained at an acceptable level, however, by continuing traffic officer control. Background development traffic is also expected to decrease the level of service from B to D at Boylston, Dalton, and Hereford streets.

The addition of project-generated traffic is expected to cause the level of service to deteriorate to E at two intersections: Huntington Avenue, Exeter Street, and Stuart Street; and Exeter Street, Blagden Street, and the Prudential Center Garage entrance. Level of service continues to be acceptable at twenty-two intersections under the 1994 Build evening peak hour condition. As noted previously, the South Ring Road and Belvidere Street location will be removed in the 1994 Build scenario.

3.5.2 1999 Levels of Service

As under 1994 No-Build conditions, only two intersections are projected to operate at deficient levels of service in the morning peak hour under 1999 No-Build conditions. The addition of project traffic is expected to cause the level of service to deteriorate to E at the same two intersections impacted under 1994 Build Conditions--Huntington Avenue, West Newton Street, and Belvidere Street; and Columbus Avenue and West Newton Street, as well as at Massachusetts Avenue and Columbus Avenue. Traffic continues to operate under acceptable level-of-service conditions at the remaining twenty-four locations in the 1999 morning Build scenario. In addition to the South Ring Road closure in the 1994 Build scenario, North Ring Road is closed in the 1999 Build condition. The removal of North Ring Road in the 1999 Build condition eliminates the North Ring Road and East Ring Road intersection and replaces it with a garage driveway along Boylston Street.

In the evening peak hour, six intersections are projected to operate under deficient levels of service under the 1999 No-Build condition. In addition to the five intersections impacted under 1994 No-Build conditions, background development traffic in 1999 is projected to cause the Exeter Street and Blagden Street intersection to drop to LOS E. The addition of project traffic in 1999 is expected to cause two intersections--Huntington Avenue, Exeter Street, and Stuart Street; and Massachusetts Avenue and St. Botolph Street--to deteriorate to deficient levels of service. Also, project traffic is projected to cause the level of service to decline from B to D at Dalton and Scotia streets. Traffic continues to operate under acceptable conditions at twenty-one of the twenty-eight locations in the 1999 evening Build scenario. Again, it should be noted that in the 1999 Build condition, South Ring Road will have been eliminated, resulting in a change in the number of locations analyzed. The elimination of North Ring Road in 1999 does not alter the number of analysis locations.

3.5.3 Level-of-Service Analysis with Mitigation

Travel Demand Reduction

Intersections projected to be deficient under 1999 Build conditions were reanalyzed with mitigated project volumes to determine impacts on volume-to-capacity ratios and levels of service. The intersections which can have improved levels of service with mitigated project volumes are limited to two intersections in the morning peak hour and one intersection in the evening peak hour, which declined to deficient levels of service because of project volumes. All other locations will be deficient with background development only and without any project volumes. Therefore, mitigated project volumes cannot result in a level-of-service improvement, although, they can result in reductions in volume-to-capacity ratios.

All signalized intersections show a small improvement in volume-to-capacity ratios from 0.01 to 0.03 except for Columbus Avenue at Massachusetts Avenue in the morning, which borders between LOS D and E, and Massachusetts Avenue at St. Botolph Street in the evening. For the unsignalized intersections, reserve capacity would improve by 22 vehicles and by 143 vehicles at Belvidere Street and the garage exit. None of the intersections, however, would experience an improved level of service because most are deficient under No-Build conditions without any project volumes. Tables III-51 and III-52 show the expected changes in volume-to-capacity ratios with demand reduction mitigation.

Traffic Operations Improvements

The deficient locations were also analyzed with traffic operations improvements (and project mitigation volumes) to determine the effect of the traffic operations mitigation measures outlined in the mitigation section. The results are shown in Tables III-51 and III-52 presented earlier. In the evening peak hour, significant improvements in volume-to-capacity and level of service are expected for signalized intersections from proposed changes along Massachusetts Avenue and controls on access to West Newton Street at Huntington Avenue. Only small changes in volume-to-capacity ratios are expected in the morning peak hour, when unmitigated conditions are expected to be generally better than in the evening peak hour.

No intersection improvements are projected for the two unsignalized locations. The projected level of service at unsignalized locations applies to side street traffic entering the main street. At Blagden Street and Exeter Street, no geometric improvements are possible to improve level of service on Blagden Street. Installation of a signal may not be desired or warranted because of relatively low volumes on Blagden Street, which is a short street providing local access. If desired, police officer control could be provided in the evening peak hour to make it easier to exit Blagden Street. At Belvidere Street, the projected level of service applies to the garage exit. Possible geometric improvements to the exit will be explored during project design. Continued police officer control will be necessary.

TABLE III-51
1999 MITIGATED ALTERNATIVE A LEVEL-OF-SERVICE ANALYSIS
MORNING PEAK HOUR*

Location Number	Description	1999 Build				With Demand Reduction and Turnpike Ramps*** V/C	LOS
		1999 No-Build V/C** LOS	Without Mitigation V/C	Without Mitigation LOS	With Demand Reduction Mitigation V/C	With Demand Reduction and Intersection Improvements V/C	LOS
9	Huntington Ave., Belvidere St., and West Newton St.	0.72 C	0.94 E	E	0.93 E	0.92 E	E
10	Columbus Ave. and West Newton St.	0.89 D	0.93 E	E	0.91 E	0.91 E**	E
11	Columbus Ave. and Massachusetts Ave.	0.89 D	0.90 D/E	D/E	0.90 D/E	0.84 D	D
13	Massachusetts Ave. and Westland Ave.	0.95 E	0.97 E	E	0.96 E	0.94 E	E

* Includes all deficient locations under Alternative A Build conditions.

** Improvements to the Massachusetts Avenue corridor are expected to divert traffic away from West Newton Street. The magnitude of this diversion has not been estimated, but could be sufficient to increase level of service to acceptable conditions.

*** Includes intersection improvements.

The principal improvements affecting level-of-service results are removal of parking on Massachusetts Avenue in peak periods to provide additional travel lanes and an evening peak period restriction on vehicles entering West Newton Street at Huntington Avenue. Improved signal progression and strictly prohibiting double-parking would also contribute to improved traffic flow along Massachusetts Avenue. Changes in lane use on Exeter Street at Huntington Avenue would contribute to improved conditions at that location in the evening peak hour.

Massachusetts Turnpike Ramp

Tables III-51 and III-52 also include an analysis of the proposed Back Bay Massachusetts Turnpike ramps, which are described below in section 3.6, Future Roadway Improvements. The proposed ramps provide a westbound exit from the Turnpike to the Back Bay and an eastbound entrance to the Turnpike. As a result, there would be an improved connection between Back Bay and the Southeast Expressway as compared to the existing routes via Herald Street and East Berkeley Street. This improved connection is expected to result in a diversion of Back Bay traffic accessing the southeast Expressway via Massachusetts Avenue to the Turnpike via the new ramps.

This section analyzes the effect of this potential diversion on levels of service at the intersections projected to be deficient under 1999 Build conditions. For this analysis, it was assumed that the current distribution of project and background traffic to the Southeast Expressway via Massachusetts Avenue and the Herald Street/East Berkeley Street pair would be altered to a even split. Currently, approximately one-quarter of project traffic uses Herald Street and three-quarters use Massachusetts Avenue. A further assumption was that 10 percent of existing through volumes along Massachusetts Avenue could be diverted to the new Turnpike ramps. The level-of-service analysis presented in Tables III-51 and III-52 are based on the above assumptions.

The assumptions about diversions to the proposed ramps were made because there are no traffic network analyses available from which to project traffic shifts due to the proposed ramps. Therefore, the analysis presented here shows the level-of-service results that could be expected given the assumptions stated above. To fully evaluate the ramps, a complete network analysis

should be undertaken to provide a solid analytic basis for estimates of traffic diversions throughout the Back Bay. This could be done as part of the Back Bay Transportation Study, which includes development of a traffic network for use in analyzing proposed changes in traffic patterns.

The analysis shows that, based on the assumptions stated above, improvements in volume-to-capacity ratios could be expected along Massachusetts Avenue and Columbus Avenue in the evening peak hour. There would be no improvements along Huntington Avenue because diverted traffic would use Huntington Avenue to reach the ramps. The unsignalized intersections would not be affected by the diversions. In the morning peak hour, the ramps would have an impact on all locations, resulting in declines in volume-to-capacity ratios as well as levels of service.

3.5.3 Saturday Levels of Service

Under the 1994 Saturday No-Build and Build scenarios, all the intersections analyzed are expected to operate at a LOS C or better. Only two intersections are expected to have a deterioration in level of service in 1994 scenarios.

Under the 1999 Saturday No-Build and Build scenarios all the intersections are expected to operate at a LOS C or better. Furthermore, all the intersections are expected to operate at the same level of service as in the 1994 scenarios.

Tables III-53 and III-54 show the level-of-service results of signalized and unsignalized intersections, respectively, for Saturday locations. Table III-43 presented previously, provides a summary of the Saturday intersection level-of-service results along with the weekday results.

TABLE III-54
SATURDAY UNSIGNALIZED INTERSECTION
LEVEL-OF-SERVICE SUMMARY

Location Number	Description	Existing ARC*	Existing LOS**	1994				1999			
				No-Build		Build		No-Build		Build	
				ARC	LOS	ARC	LOS	ARC	LOS	ARC	LOS
17	Newbury St. and Gloucester St.	260	C	253	C	255	C	235	C	232	C
18	Newbury St. and Fairfield St.	444	A	387	B	382	B	374	B	369	B
20	Belvidere St. and Dalton St.	650	A	642	A	601	A	632	A	569	A

* Available reserve capacity in vehicles per hour.

** Level-of-service.

TABLE III-55
LEVEL-OF-SERVICE SUMMARY
ALTERNATIVE BUILD PROGRAMS*

Location Number	Description	1994 Alternative A			1994 Alternative B			1999 Alternative C		
		V/C**	LOS***	LOS	V/C	LOS	LOS	V/C	LOS	LOS
Morning Peak Hour										
Signalized Intersections:										
9	Huntington Ave., West Newton St., and Belvidere St.	0.91	E		0.89	D	-	0.95	E	0.93 E
10	Columbus Ave. and West Newton St.	0.90	E		0.89	D	-	0.93	E	0.92 E
11	Massachusetts Ave. and Columbus Ave.	-	-		-	-	-	0.90	E	0.90 E
Unsignalized Intersections:										
25	Belvidere St. and Garage	-	-		-	-	-	(193)	D	(203) C -
Evening Peak Hour										
Signalized Intersections:										
7	Huntington Ave., Exeter St., and Stuart St.	0.91	E		0.90	E	0.89	0.94	E	0.94 E
9	Huntington Ave., West Newton St., and Belvidere St.	1.01	F		1.01	F	1.01	1.05	F	1.05 F
19	Massachusetts Ave. and St. Botolph St.	-	-		-	-	-	0.99	E	0.99 E
Unsignalized Intersections:										
26	Dalton St. and Scotia St.	-	-		-	-	-	(155)	D	(196) D
27	Exeter St. and Blagden St.	(67)	E		(69)	E	(69)	-	-	- -
* Based on the BRA Scope, intersections analyzed for Alternative B are those that declined to LOS E or F or declined two or more levels between No-Build and Alternative A. Build conditions were not analyzed for Alternative B. The same criterion was used for Alternative C.										
** Volume-to-capacity ratio for signalized intersections; available reserve capacity for unsignalized locations.										
*** Level-of-service.										

* Based on the BRA Scope, intersections analyzed for Alternative B are those that declined to LOS E or F for declined two or more levels between No-Build and Alternative A Build conditions. Intersections already at LOS E or F were not analyzed for Alternative B. The same criterion was used for Alternative C.

** Volume-to-capacity ratio for signalized intersections; available reserve capacity for unsignalized locations.

*** Level-of-service.

3.5.4 Level-of-Service Analysis for Build Alternatives

Alternatives B and C

Alternatives B and C represent smaller versions of the Full-Build development program, Alternative A. Study area intersections were selected for analysis for the Build Alternatives B or C based on the criterion stated in the BRA Scoping Determination. The scope requires that all intersections that deteriorate to a deficient level of service (E or F) or drop two levels of service from No-Build traffic volumes to Alternative A volumes will be analyzed with Alternative B volumes. The same criterion was applied to changes from No-Build to Alternative B Build volumes to determine if Alternative C volumes should be analyzed. Table III-55 contains the results.

In summary, reducing program areas makes little difference to the functioning of intersections projected to be deficient in 1999 or impacted significantly by the development. Of the eight intersections analyzed, seven operate at a similar LOS under Alternatives A, B, or C. The one intersection that improves is the exit to Belvidere Street from the Prudential Center Garage. It moves from LOS D to LOS C, both acceptable levels. In 1994, however, minor reductions in volume-to-capacity ratios occur with Alternatives B or C, resulting in some intersections shifting from LOS E to D.

Under the 1994 Alternative B Build scenario, the following intersections were analyzed (based on the above criterion) for the morning peak hour:

- o Huntington Avenue, West Newton Street, and Belvidere Street
- o Columbus Avenue and West Newton Street
- o Massachusetts Avenue and Columbus Avenue

TABLE III-53
SATURDAY SIGNALIZED INTERSECTION
LEVEL-OF-SERVICE SUMMARY

Location Number	Description	1994						1999					
		Existing		No-Build		Build		No-Build		Build		No-Build	
		V/C*	LOS**	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS
6	Boylston St. and Exeter St.	0.50	A	0.50	A	0.52	A	0.51	A	0.54	A	0.51	A
7	Huntington Ave., Exeter St., and Stuart St.	0.52	A	0.53	A	0.54	A	0.55	A	0.55	A	0.55	A
8	Huntington Ave., East Ring Rd. and Harcourt St.	0.40	A	0.41	A	0.42	A	0.41	A	0.43	A	0.41	A
9	Huntington Ave., West Newton St., and Belvidere St.	0.56	A	0.56	A	0.60	B	0.58	A	0.63	B	0.58	A
16	Boylston St., Dalton St., and Hereford St.	0.41	A	0.42	A	0.45	A	0.43	A	0.49	A	0.43	A

* Volume-to-capacity ratio.

** Level-of-service.

The results indicate that two intersections--Huntington Avenue, West Newton Street, and Belvidere Street; and Columbus Avenue and West Newton Street--operate at acceptable levels of service under Alternative B project volumes. The Massachusetts Avenue and Columbus Avenue intersection remains deficient in 1994 with Alternative B, and does not improve enough to be acceptable with Alternative C, since it is largely background growth that makes the intersection function at unacceptable levels.

For the 1994 evening peak hour, the following intersections were analyzed for the Alternative B and Alternative C Build scenarios:

- o Huntington Avenue, Exeter Street, and Stuart Street
- o Huntington Avenue, West Newton Street, and Belvidere Street
- o Exeter Street and Blagden street

The results indicate that none of the intersections show enough improvement to become acceptable with the reduced 1994 Alternative B project volumes. Under Alternative C, only the intersection of Huntington Avenue, Exeter Street, and Stuart Street improves to an acceptable level of service (LOS D). Again, it is worth noting that background growth of traffic is the major cause of the decline in service levels of these intersections, so changes in traffic generated by the Prudential Center can only affect LOS in marginal ways.

In the 1999 scenarios, the Belvidere Street exit from the Prudential Center Garage was analyzed in the morning peak hour, in addition to the three intersections analyzed for 1994. As already noted, the Belvidere Street garage exit intersection is expected to improve to LOS C with Alternative B in contrast to LOS D with Alternative A. The level of service at the three remaining locations is not projected to change under either Alternative B or Alternative C traffic volumes.

For the evening peak hour in 1999, the intersections of Massachusetts Avenue and St. Botolph Street, and Dalton and Scotia streets were analyzed, in addition to two intersections analyzed for 1994. The analysis indicates that all locations are expected to operate at a similar level of service for Alternatives A, B, and C.

Alternatives A2, B2, and C2

The level-of-service analysis for Alternatives A2, B2, and C2 assumes a shift in land use between the north and south side of the Prudential Center. The resulting net traffic impact is expected to have little or no effect on operations at any study intersections. Therefore, the results of the Alternatives A, B, and C level-of-service analysis are expected to remain the same for Alternatives A2, B2, and C2, respectively.

3.6 Future Roadway Improvements

This section investigates potential roadway improvements and their possible impact on traffic operations under future conditions, which includes:

- o Proposed Massachusetts Turnpike ramps
- o The Central Artery/Third Harbor Tunnel project
- o Reconstruction of the Harvard Bridge
- o The City of Boston's traffic signal improvement program
- o The narrowing of Huntington Avenue for the 116 Huntington Avenue project
- o Closure of the Huntington Avenue spur
- o The Back Bay Transportation Study

The last item, although not a roadway improvement itself, could lead to a series of recommended improvements.

3.6.1 Proposed Massachusetts Turnpike Ramps

The City of Boston has proposed improving access between Back Bay and downtown Boston via the Massachusetts Turnpike through the addition of two ramps in the Back Bay. One is a westbound off-ramp at Berkeley Street that would allow Turnpike traffic from I-93 and downtown to exit at the Back Bay. There currently is no exit in the area. The first westbound exit (at Allston/Brighton) is too far west to serve the Back Bay. Construction of the off-ramp at Berkeley Street requires removal of the existing westbound on-ramp at Arlington Street. Three other on-ramps at Clarendon Street, Huntington Avenue, and Massachusetts Avenue provide access to the westbound Turnpike from the Back Bay.

The second proposed ramp is an eastbound on-ramp at the intersection of Arlington, Tremont, and Herald streets. It would allow traffic from Back Bay to travel to downtown and I-93 via the Turnpike. Downtown traffic now generally uses Stuart and Kneeland streets, while I-93 traffic uses Herald Street (I-93 south) or Storrow Drive (I-93 north). One major concern raised in the past with regard to this ramp is the adequacy of the weaving area on the Turnpike between the ramp and the ramps at the South Bay interchange with I-93.

No detailed traffic analysis of the impact of the proposed ramps throughout the Back Bay has been conducted. Nevertheless, consideration of travel patterns in the Back Bay suggest that the ramps would likely provide relief to some areas of the Back Bay. One of these areas is the Massachusetts Avenue corridor to the Southeast Expressway (I-93 south) and West Newton Street. Drivers accessing the Expressway from the area of the Prudential Center can use either Massachusetts Avenue and West Newton Street or the East Berkeley Street and Herald Street routes. According to surveys of Prudential employees, more than twice as many use Massachusetts Avenue as use the East Berkeley Street and Herald Street route. Providing a Turnpike connection to I-93 would provide an improved alternative to Massachusetts Avenue. Such an improved alternative may be necessary to reduce projected deficiencies along Massachusetts Avenue and West Newton Street.

A second potential area of relief in the Back Bay is along Berkeley and Dartmouth streets. Both roads are used to access I-93, Route 1, and Logan Airport via Storrow Drive. The opening of the Third Harbor Tunnel and the Turnpike ramps would provide direct access to the airport from Back Bay. In addition, the ramps would provide direct access to the improved Central Artery and may provide an improved alternative to I-93 north and Route 1 over Back Bay streets and Storrow Drive.

The Back Bay Transportation Study is analyzing the potential traffic, circulation, and neighborhood impacts of the proposed ramps. In addition, the Massachusetts Turnpike Authority has undertaken a study of Turnpike access in general and should also be considering the Back Bay ramps. If construction feasibility, traffic engineering, and funding issues can be resolved, it appears that the proposed ramps, in conjunction with the Central Artery/Third Harbor Tunnel project could provide improved access to Back Bay and relief to streets within the Back Bay.

3.6.2 The Central Artery/Third Harbor Tunnel Project

The Central Artery/Third Harbor Tunnel (CA/THT) project is the largest highway construction project ever undertaken in downtown Boston. It consists of two major components:

- o The replacement of the six-lane elevated section of the Central Artery (I-93) with a new eight- to ten-lane road, mostly underground, between the Southeast Expressway and Charlestown.
- o The extension of the Massachusetts Turnpike (I-90) to Logan Airport via the Seaport Access Road that passes through commercial land in South Boston and a four-lane tunnel under Boston Harbor.

Construction on the project is scheduled to begin in 1991 with the construction of the Seaport Access Road in South Boston. The third harbor tunnel is scheduled to be open to traffic by 1994. Beginning and ending dates for construction of the northbound and southbound sides

of the Central Artery are uncertain, but construction for the entire project is scheduled to be completed in 1998. This includes removal of the existing elevated structure.

The impact of construction and completion of the CA/THT project on the Prudential Center study area is uncertain. The Executive Office of Transportation and Construction (EOTC) of the Commonwealth of Massachusetts has set as a major goal the maintenance of the six-lane capacity of the existing Central Artery until the new underground replacement is ready. The state is working to minimize construction impacts by maintaining existing roadway capacity and encouraging the use of transit. Many of the improvements to increase the MBTA's capacity will be on-line by the time construction begins.

The EOTC has projected improvements to traffic conditions in downtown Boston because of the CA/THT. The EOTC is projecting that the expanded artery and new harbor tunnel will reduce the congestion on the artery and divert an estimated 40,000 vehicles back onto the interstate system from local streets. Although the impacts will be most noticeable downtown, some spillover benefits may occur on the Back Bay.

3.6.3 Reconstruction of the Harvard Bridge

The Harvard Bridge over the Charles River connects Back Bay and Cambridge. The existing four-lane bridge is currently under rehabilitation and trucks are prohibited. A truck restriction was in effect prior to reconstruction because of the deteriorated condition of the bridge. Massachusetts Avenue is four-lanes wide, but is reduced to two-lanes at the bridge due to construction, causing a bottleneck situation.

The construction project is scheduled to be completed by 1990. Completion of the construction will eliminate the bottleneck and provide a continuous four-lane flow between Back Bay and Cambridge, improving traffic conditions on Massachusetts Avenue. Also, trucks will be allowed to use the bridge after completion of the construction.

3.6.4 The City of Boston's Traffic Signal Improvement Program

The Boston Transportation Department (BTD) is actively involved in a program to improve signal systems in downtown Boston and the Back Bay. The program is jointly funded by the Massachusetts Department of Public Works (MDPW) and the Federal Highway Administration. Phase I of this effort involves 233 signals located in downtown Boston, the Financial District, and Back Bay as far west as Massachusetts Avenue. The Prudential Center Redevelopment study area is included within the area of improvements. Phase I of the project is expected to be complete and operational in 1990. The goal is to centralize computer control of all signal subsystems. Existing controls are scheduled to be upgraded using real-time detection of traffic volume and density on selected roadway links. Based on measured activity at each intersection, one of several timing plans designed for each location will be implemented.

The project will enhance the city's ability to coordinate and sequence traffic signals, and will allow for immediate timing adjustments based on traffic volumes. It would generally improve traffic flow in downtown Boston and the Back Bay area, especially along corridors (such as Massachusetts Avenue) which currently do not have optional signal progression.

3.6.5 The Narrowing of Huntington Avenue for the 116 Huntington Avenue Project

The proposed development of 116 Huntington Avenue shifts of 6-feet of the Huntington Avenue southside curb line into the street between Garrison Street and Harcourt Street. Although this shift narrows Huntington Avenue in front of the project, it aligns the new curb line with the curb line on the adjacent block to the west. However, the number of lanes on Huntington Avenue does not change, therefore, no discernable effect is expected on traffic flow.

3.6.6 Closure of the Huntington Avenue Spur

The proposed development at 25 Huntington Avenue includes the closure of the Huntington Avenue spur (the portion of Huntington Avenue located north of the Massachusetts Turnpike on-ramp). Much of the traffic using the spur is accessing parking at the on-street metered locations or is searching for an open space at those meters. These spaces are eliminated with the proposed development of the site and, therefore, some of the traffic associated with that parking is eliminated from Huntington Avenue. The remaining traffic is shifted to the travel lanes on the main section of Huntington Avenue located south of the Turnpike on-ramp.

The intersection on Huntington Avenue, Exeter Street, and Stuart Street was analyzed for the closure of the spur, with the shift of volume to the three travel lanes on the main section of roadway. The analysis was conducted for the 1999 Build mitigated evening peak hour scenario. The analysis indicates that there would be no change in volume-to-capacity ratio or the level of service of the intersection with the closure of the spur.

3.6.7 The Back Bay Transportation Study

In the fall of 1988, the Boston Transportation Department (BTD) began a transportation study of the entire Back Bay including the Prudential Center Redevelopment study area. Through the early part of 1989, the study focused on the data collection and inventory phase of the study. No reports or data regarding existing conditions have been published at this time and, thus, no results are available to include in this report.

During the course of the preparation of the Transportation Access Plan, the project team met with the consultant conducting the Back Bay Transportation Study, as well as the staff of the BTD responsible for the study. The following objectives were outlined for the study:

- o Identify low-cost and easily implemented intersection improvements and incorporate them into an immediate action plan

- o Consider long-term major intersection improvements, corridor treatments, circulation, and demand reduction measures
- o Analyze the potential traffic impacts of the proposed Turnpike ramps discussed above

As more information becomes available from the Back Bay Transportation Study, it will be incorporated in the Final Project Impact Report for the Prudential Center Redevelopment. In the meantime, the results of this analysis are available to the Back Bay Transportation Study team for consideration in their effort.

3.7 Vehicle Access

Changes in access to the Prudential Center Parking Garage are completed in two phases. The first phase includes the closure of South Ring Road by 1994. In conjunction with this closure, the existing entrance and exit on South Ring Road is modified as shown in Figure III-33. The existing exit from the South Garage near East Ring Road is converted to an entrance for automobiles from Huntington Avenue. Currently, this access is used only for exiting vehicles in the evening peak period. The new entrance replaces the existing South Ring Road entrance farther to the west for automobiles entering from Huntington Avenue. The west driveway continues to operate as an entrance, accessible only to automobiles exiting the Turnpike and to trucks entering from Huntington Avenue. Automobiles and trucks coming off the Massachusetts Turnpike continue to have a direct connection to the Prudential Center Garage through this west entrance.

This arrangement allows South Ring Road to be completely removed and the pedestrian environment along Huntington Avenue to be greatly enhanced. Removal of South Ring Road permits development of retail space along Huntington Avenue with the intention of providing a more attractive and inviting pedestrian path. The enhancement of the pedestrian environment along Huntington Avenue has been one of the design objectives of the Boston Redevelopment Authority (BRA) and the PruPAC.

Redevelopment

Access Driveways

The Boston Transportation Department (BTD), however, has expressed concern with the proposed design from a traffic perspective. The BTD has indicated that the proposed design will require weaving maneuvers between trucks entering the garage from Huntington Avenue and cars entering Huntington Avenue from the Turnpike. An alternative approach would be to maintain a portion of South Ring Road between East Ring Road and the garage entrance to provide an access road for trucks. Direct access from Huntington Avenue at the Turnpike ramp would be physically blocked. The BRA has indicated that maintaining a portion of South Ring Road may not be compatible with its urban design objectives. Resolution of the conflict will be explored further during preparation of the Final Project Impact Report for the Prudential Center Redevelopment.

Reconfiguring the garage access does not alter the Turnpike access to Huntington Avenue. The removal of South Ring Road is expected to cause some shifts in approach volumes at two intersections: Huntington Avenue, West Newton Street, and Belvidere Street; and Huntington Avenue and East Ring Road. The effects of these shifts are included in the 1994 and 1999 Build intersection analyses. Because of these volume shifts, an additional exclusive right-turn lane is proposed for Huntington Avenue westbound at West Newton and Belvidere streets (see Mitigation Section for more detail).

The second stage of development is expected to be completed by 1999. Changes in the North Garage access will result from the closure of North Ring Road by 1999. With the removal of North Ring Road, two access roadways intersect directly with Boylston Street and replace the existing entrance from Boylston Street and exit to East Ring Road. Just west of Fairfield Street, an entrance to the existing Star Market loading dock is provided for trucks. The other access point is a garage entrance and exit east of Fairfield Street.

In addition to the changes in access associated with the removal of South and North Ring roads, changes are also made to accommodate relocation of the supermarket to East Ring Road between Huntington Avenue and the Gloucester Apartments. These include a minor narrowing of East Ring Road to accommodate a wider sidewalk on the west side and a cut-out area along

the east side in front of the supermarket. No changes in garage access are proposed for East Ring Road.

3.8 Future Loading Areas

Based on the survey of existing dock utilization which is described in the Existing Conditions section, it is estimated that up to eight additional loading bays may be required to serve the new office and retail areas. Additional delivery vehicle arrivals to the Prudential Center are expected to total almost 176 and should follow a pattern similar to existing arrivals.

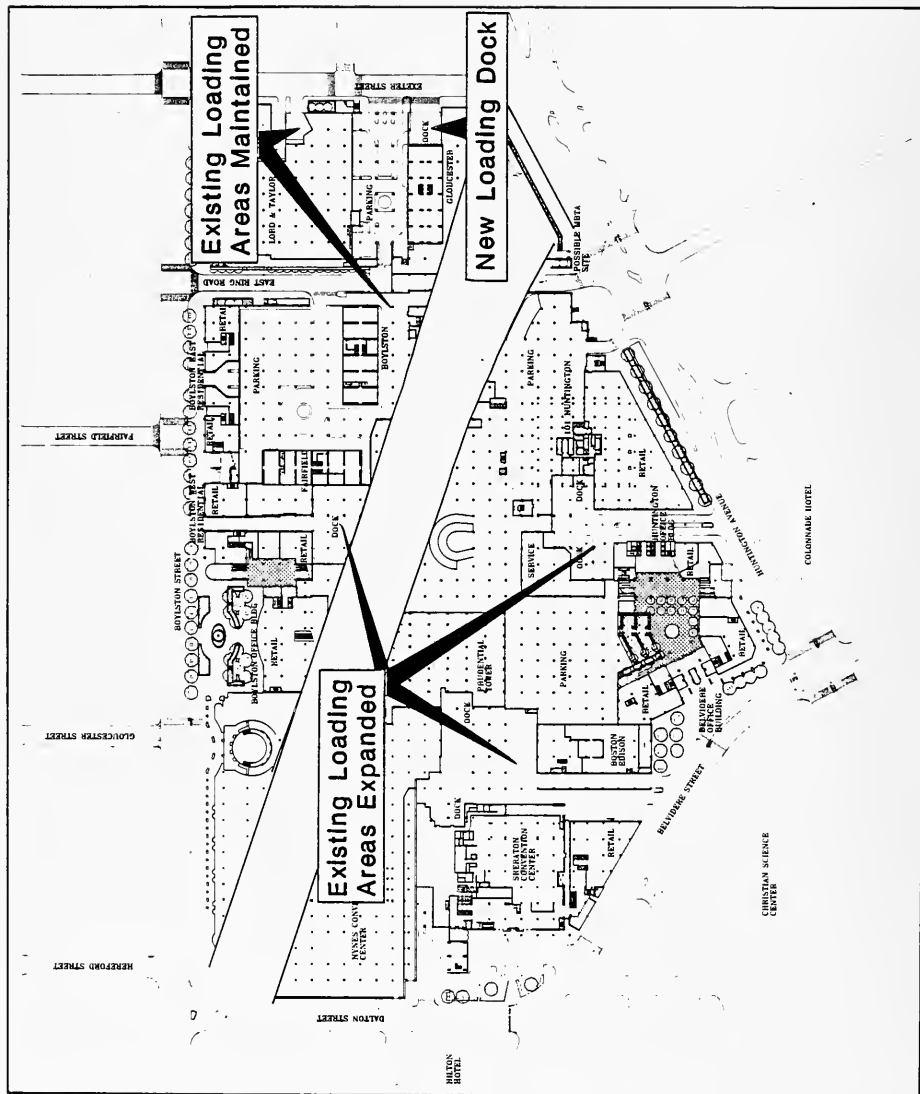
Proposed changes in loading facilities are shown conceptually on Figure III-34. These changes include expansion of the three major dock areas (Boylston dock, Huntington dock, and Prudential Tower/Sheraton Hotel dock) and development of a new loading dock off Exeter Street to serve the new local commercial center. Specific changes are as follows:

- o Huntington Dock. Spaces are added to serve the new office tower.
- o Prudential Tower/Sheraton Dock. Spaces are added on the south side of this area to serve the retail above and the new Belvidere office or residential structure.
- o Boylston Dock. The supermarket is relocated to East Ring Road and spaces are added to serve the expanded retail space and new office and residential structures.
- o The New Commercial Dock on Exeter Street. This new off-street dock serves both the neighborhood commercial block and the existing Gloucester Apartments tower. The loading dock contains four bays, three to accommodate trucks and delivery vehicles and one to accommodate a trash compactor. To reach the dock, trucks must stop on Exeter Street and back into the dock. To accomplish this maneuver, a 50-foot truck

Prudential Center Redevelopment

Fig. III-34 Future Loading Areas

0 100 200
Scale : feet



would temporarily block two of the three travel lanes. Based on the information provided by Star Market, most supermarket deliveries take place early in the morning. It was also observed during the loading survey, conducted by Vanasse Hangen Brustlin, Inc., that very few deliveries were made at the Star Market dock after 1:00 PM.

- o Lord and Taylor Dock. There are no changes proposed.
- o Boylston Apartment Tower Dock. There are no changes proposed.

During the course of preliminary planning for the Alternative A scenario, two major changes in loading areas along Huntington Avenue were investigated: (1) consolidating the 101 Huntington Avenue dock area and the Prudential Tower dock area, or (2) providing alternative access to the 101 Huntington Avenue dock. The following provides an evaluation of the two approaches:

- o The first approach involves connecting the two existing docks at 101 Huntington Avenue and the Prudential Tower via the existing automobile exit lane at the base of the Tower. If that roadway was expanded to accommodate trucks, then the South Ring Road truck entrance/exit could be eliminated and all trucks could enter and exit at Belvidere Street for both dock areas.

This plan is infeasible because of physical constraints within the garage. The major constraint is lack of sufficient clearance height along the roadway for trucks. The existing loading docks are two stories high, but the garage area between the two docks is one level high. Providing sufficient clearance requires removing the floor of the mezzanine level above. Not only is this a difficult and expensive undertaking, but it eliminates access to a section of the mezzanine level containing almost 100 parking spaces. A related problem is that the floor for the new truck corridor would have to be reinforced to support the load of truck traffic. Other problems with this approach include: inadequate corner radii for turning trucks inside the garage; inadequate

width in front of the Prudential Tower for two-way traffic and a drop-off/pick-up area; cars and trucks turning across each other's paths; and truck/pedestrian conflicts with truck traffic passing by the entrance to the Prudential Tower.

- o The second approach to providing alternative access to the 101 Huntington Avenue dock involves constructing a new roadway north of the existing South Ring Road between Belvidere Street and the dock. The major problem with this approach is that in order to provide sufficient clearance, the north/south pedestrian corridors rise abruptly from street level at Huntington Avenue to the deck level within the Prudential Center. This defeats the design objective to improve the major north/south corridor east of the Prudential Tower by providing a more gradual rise from one level to the next. An additional concern is that the proposed entrance is located on Belvidere Street near the pedestrian crosswalk and existing garage entrance. This perpetuates the existing undesirable configuration created by South Ring Road that is proposed for removal with the current Alternative A plan.

3.9 Parking

3.9.1 Parking Demand

The number of parking spaces required by the proposed new Prudential Center office and retail uses was estimated from the trip generation projections for these uses. Parking requirements are divided into long-term employee parking and short-term business visitor and shopper parking. Turnover rates of 1.0 cars per space per day for long-term employee parking and 3.0 for short-term visitor and shopper parking were applied to the projected number of additional vehicles arriving at the site each day. Turnover rates represent the average number of different vehicles that use a space each day. For employees, only one vehicle is assumed to use a space each day, while for visitors whose stays are shorter, an average of 3.0 vehicles per day are

expected to use each space. The short-term turnover rate is based on Prudential Center Garage survey data which indicates that the average length of stay for visitors was less than two hours and that 85 percent of all visitors park for less than two hours.

At the end of Stage II (Full-Build), a total of 1,732 spaces are required to meet the unmitigated demands of the new office and retail development. This demand is divided between 1,273 long-term spaces and 459 short-term spaces. In addition to the office and retail demand, residential parking spaces are needed for the proposed 300 condominium units. Based on marketing information, it is estimated that an average of 1.33 spaces per unit, or a total of 400 spaces, are necessary for the residential component of the development. As a result, total parking needs for the unmitigated full development are 2,132 parking spaces.

3.9.2 Parking Demand with Mitigation

The Transportation Mitigation Plan presented later in this report sets forth a program of measures to reduce the amount of traffic generated by the redeveloped Prudential Center. This program also results in a reduction in the parking demand generated by the existing development. Based on applying the mitigation goals established in the mitigation plan to the new development, the parking demand generated at Full-Build is projected to be reduced by 298 spaces. Applying the mitigation program to the existing Prudential Center results in a further reduction in parking demand of 396 spaces. With demand reduction mitigation measures applied to the entire Prudential Center, the total additional demand for parking in 1999 is approximately 1,438 spaces versus the 2,132-space demand projected for the unmitigated project.

Table III-56 summarizes the increased parking demand for the Prudential Center Redevelopment with and without the proposed mitigation program. The table also shows the available parking supply to address that demand. The proposed parking supply is described in detail in the following section.

TABLE III-56
1999 ALTERNATIVE A BUILD
PARKING SUPPLY/DEMAND SUMMARY

PARKING DEMAND

Office/Retail:	
Long-term (turnover rate of 1.0)	1,273
Short-term (turnover rate of 3.0)	<u>459</u>
Subtotal	1,732
Residential @ 1.33 spaces/unit	<u>400</u>
TOTAL	2,132
Mitigation Reduction*:	
New Development	-298
Existing Prudential Center	<u>-396</u>
Mitigation Total	<u>-694</u>
TOTAL	1,438

PARKING SUPPLY

Existing Surplus:	371
Average day for public spaces only	
No Hynes Convention Center parking included	
Increase in Supply from Management Changes:	<u>799</u>
Attendant and valet parking	
Stacked parking (2-3 deep)	
TOTAL	1,170

DEMAND/SUPPLY SUMMARY

Demand with Mitigation	1,438
Supply (existing surplus plus increases)	<u>-1,170</u>
DEFICIT	268

* Demand reduction based on meeting the following goals:

- o Office work automobile mode percentages reduced from 50% to 45%.
- o Office work vehicle occupancy rate (VOR) increased from 1.5 to 1.8.
- o Retail and hotel work VOR increased from 1.4 to 1.6.

3.9.3 Parking Supply

Existing Surplus

On an average day, the existing demand for spaces is less than the available supply in the Prudential Center Garage. As shown in the Existing Conditions section, there are 371 surplus spaces available in the garage at peak times on an average day. These spaces are available to address part of the increased demand generated by the Prudential Center Redevelopment. Applying these 371 spaces to the mitigated demand of 1,438 spaces results in a deficit of 1,067 spaces. The developer has proposed that the future supply of spaces within the Prudential Center Garage be increased to address the demand. The number of additional parking spaces that can be provided is dependent on two factors: (1) the change in supply resulting from reconstruction of the site to accommodate additional development, and (2) changes due to improvements in the management of the space available within the garage.

Supply Changes

The Prudential Center Redevelopment results in the loss of spaces in some garage locations and the addition of spaces in other areas. Structural changes resulting from reconstruction of the site affects parts of the existing garage and the number of spaces that can be provided. The addition of the office building and two residential buildings along Boylston Street impacts the street level of the North Garage, while the construction of the two office buildings along Huntington Avenue and Belvidere Street impacts the street level of the South Garage. Spaces are lost where construction of foundations for new buildings disrupt the existing garage, while some spaces are gained from a limited extension of the street level of the garage under new buildings on the Huntington Avenue side. The net effect is expected to be only a minor change in the number of spaces available.

The major change in the parking supply results from changes in management of the existing garage to allow it to accommodate more vehicles. The principal change is to provide stacked or tandem parking in various locations. Stacked or tandem parking is a method to manage parking whereby two or more spaces are placed one immediately behind another. Only the space on the aisle may be accessed directly. The deeper spaces must be accessed through the aisle space and may require moving any vehicles parked along the aisle. The advantage of this arrangement is that it reduces the number of circulation aisles and increases the area devoted to parking vehicles. In most cases, cars are stacked two deep (i.e., no vehicle is blocked by more than one vehicle). Tandem spaces also can be self-park spaces (when a single user controls a pair of spaces). If locations are used, however, for tandem parking, they will be supported by attendants or valets.

Based principally on management changes in the garage, the capacity of the garage is expanded by approximately 799 parking spaces. This increase, when added to the 371 spaces of existing excess capacity, provides a total of 1,170 spaces to meet most of the projected mitigated demand of 1,438 spaces. The overall result is a deficit of 268 parking spaces.

The projected deficit is an important factor in the success of the transportation mitigation program. The program provides strong incentives for drivers to switch to ridesharing and transit. A deficit of parking spaces provides further encouragement to drivers to change travel behavior. Although more spaces could be provided within the garage, this is not proposed to ensure the success of the mitigation program.

Future Parking

Figures III-35A, III-35B, and III-35C, and III-36A, III-36B, and III-36C show areas in the North and South garages, respectively, where the layout changes to provide an increase in the number of spaces. These areas were selected based on their suitability to support a stacked or tandem parking arrangement. The most suitable areas are those located off the main garage

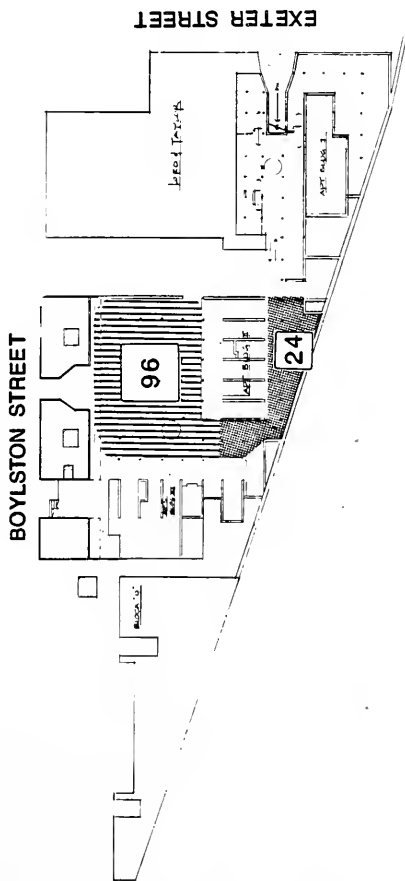
Prudential
Center
Redevelopment

Fig. III-35A
Future
Parking Layout
North Garage
Mezzanine Level

LEGEND:

- 8 No. of Spaces
 Apartment
 Reserved
 Stack/Attended
 Apartment
 Reserved
 Self Park



0 50 100
Scale: feet



Prudential
Center
Redevelopment

Fig. III-35B
Future
Parking Layout
North Garage
Street Level

LEGEND:

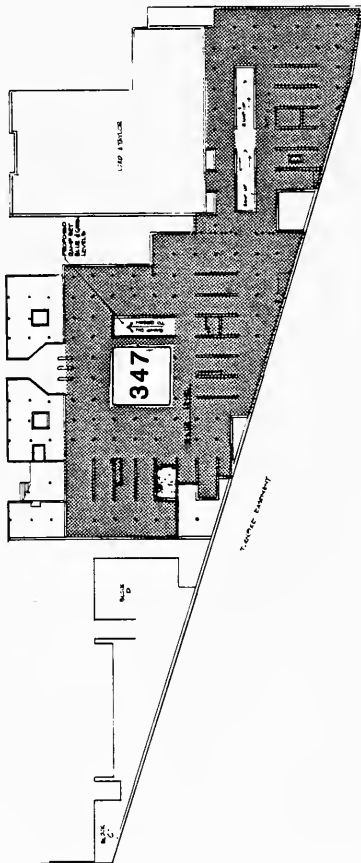
-  No. of Spaces
 Public Self Park

0 50 100
Scale: feet



BOYLSTON STREET

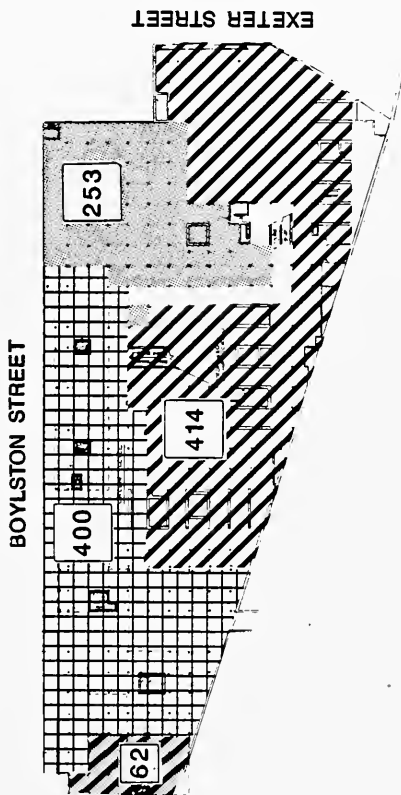
EXETER STREET












Prudential
Center
Redevelopment

Fig. III-35C

Future
Parking Layout
North Garage
Lower Level



LEGEND:

-  No. of Spaces
-  Office Reserved
-  Attended/Stacked
-  Condominium Reserved
-  Attended/Stacked
-  Apartment Reserved
-  Attended/Stacked
-  Retail/Public
-  Valet

0 50 100
Scale : feet



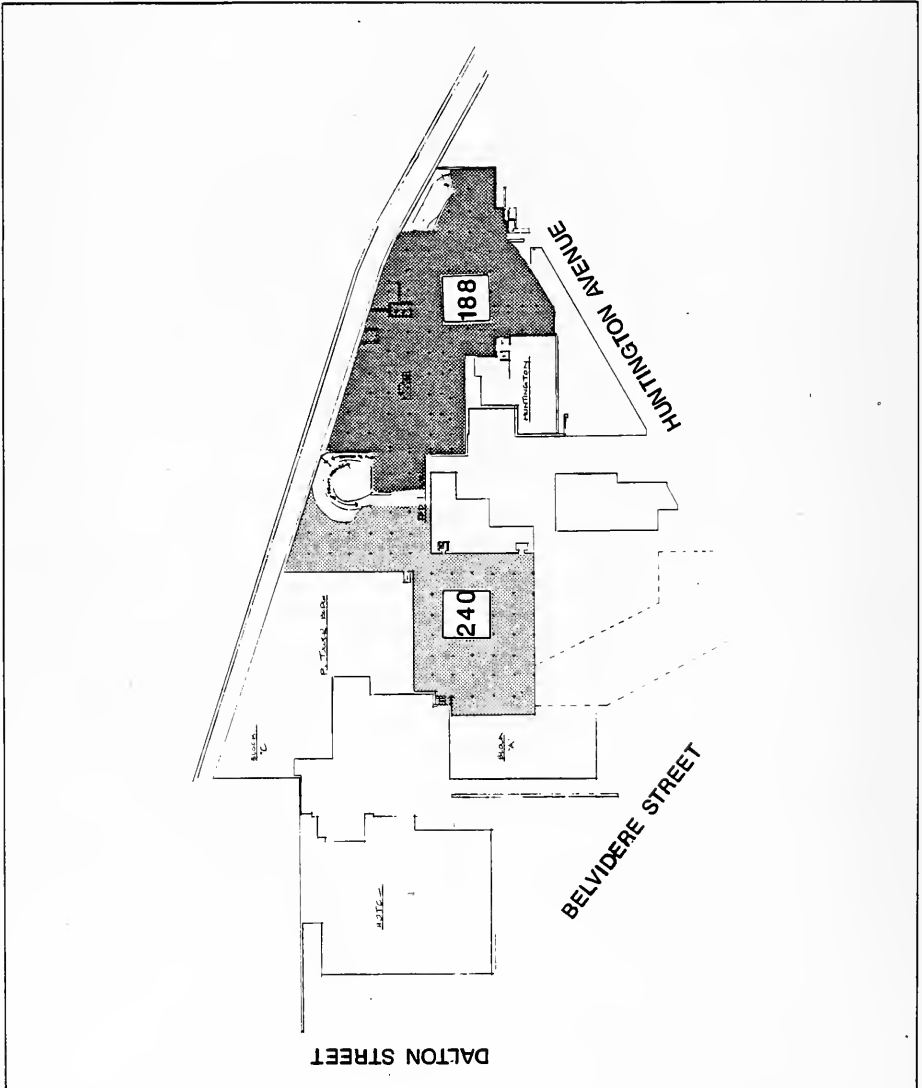
Prudential
Center
Redevelopment

Fig. III-36A
Future
Parking Layout
South Garage
Mezzanine Level

LEGEND:

- 8 No. of Spaces
- Office Reserved
- Valet Park
- Public Self Park





0 50 100
Scale: feet



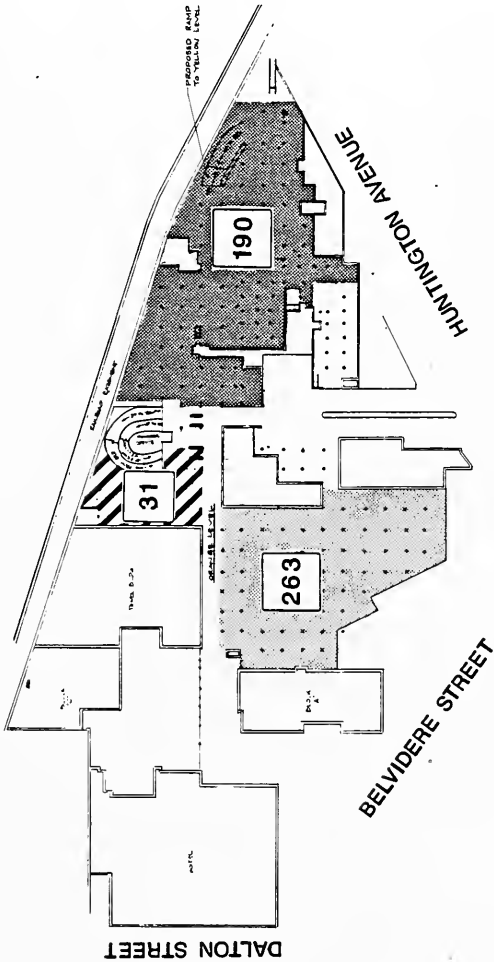
Prudential
Center
Redevelopment

Fig. III-36B
Future
Parking Layout
South Garage
Street Level

LEGEND:

-  No. of Spaces
-  Public Self Park
-  Office Reserved
Valet Park
-  Office Reserved
Self Park

0 50 100
Scale : feet







Prudential
Center
Redevelopment

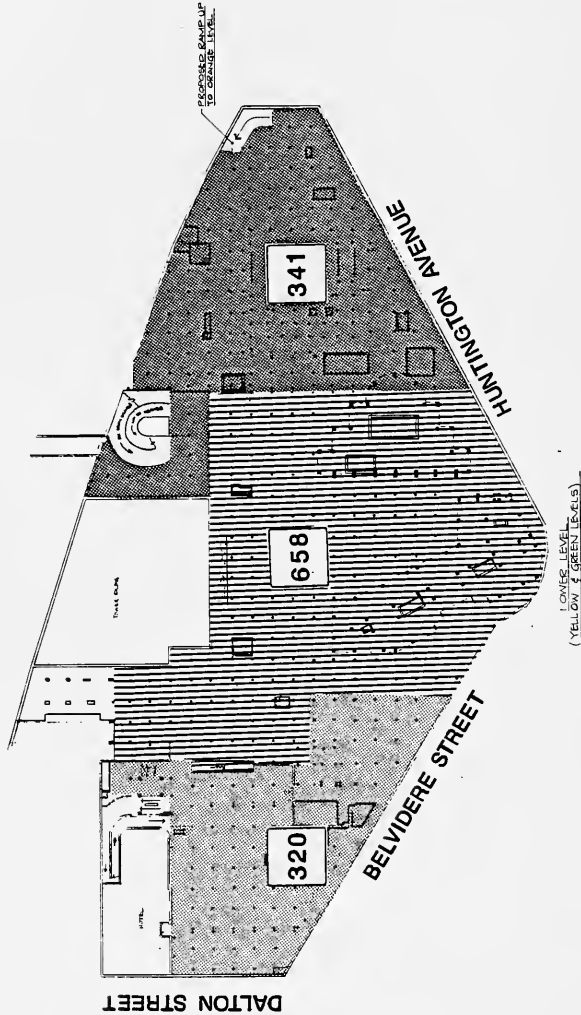
Fig. III-36C
Future

Parking Layout
South Garage
Lower Level

LEGEND:

-  No. of Spaces
-  Public Self Park
-  Office/Public Attendant Park
-  Hotel Reserved Valet Park

0 50 100
Feet
Scale : feet



circulation routes, which can be controlled without disrupting garage circulation. Another factor was to select areas used primarily by commuters, hotel guests, and residential tenants or owners. These groups are the most easily accommodated by a stacked layout with attendant or valet parking because they leave their vehicles all day or extended periods of time. Short-term parkers such as office visitors and shoppers may be less interested in valet or attendant parking. Changes in future garage layout are described in detail below and Table III-57 shows the resulting future parking space inventory.

North Garage

The mezzanine level as shown on Figure III-35A includes ninety-six reserved apartment parking spaces. These are attended spaces with, at most, two-deep stacking. There is also twenty-four apartment-reserved self-park spaces.

The street level has 347 public self-park spaces as shown in Figure III 35B. This represents only a minor change from existing conditions.

TABLE III-57
FUTURE PARKING SPACE INVENTORY

	<u>Reserved</u>		<u>Public</u>		<u>Total</u>
	<u>Self-Park</u>	<u>Valet</u>	<u>Self-Park</u>	<u>Valet</u>	
<u>North Garage:</u>					
Mezzanine Level	24	96	0	0	120
Street Level	0	0	347	0	347
Lower Level	<u>0</u>	<u>876</u>	<u>0</u>	<u>253</u>	<u>1,129</u>
Total North	24	972	347	253	1,596
<u>South Garage:</u>					
Mezzanine Level	0	240	188	0	428
Street Level	31	263	190	0	484
Lower Level	0	320	341	658	1,319
Total South	31	823	719	658	2,231
TOTAL GARAGE	55	1,795	1,066	911	3,827

The lower level as shown in Figure III-35C has four distinct areas:

- o 62 attended office-reserved spaces stacked two-deep
- o 400 attended condominium-reserved spaces with some spaces stacked two-deep
- o 414 attended apartment-reserved spaces with some spaces stacked two-deep
- o 253 public valet parking spaces with stacking up to three-deep

South Garage

The mezzanine level of the South Garage is shown in Figure III-36A and contains 240 reserved office valet parking spaces stacked two- to three-deep. It also provides 188 public self-park spaces which currently exist.

The street level of the South Garage provides the following as shown in Figure III-36B:

- o 31 office-reserved self-park spaces
- o 263 office-reserved valet spaces with no more than two-deep stacking
- o 190 public self-park short-term spaces as currently provided

The lower level of the South Garage has three major areas as shown on Figure III-36C:

- o 320 valet spaces for the Sheraton Hotel; most of the area has two- to three-deep stacked parking

- o 658 valet public parking spaces with two- to three-deep stacked parking
- o 341 self-park spaces for the public

Existing parking spaces are compared with future parking spaces by level in Table III-58. The North Garage gains 343 spaces, while the South Garage gains 456 spaces as a result of construction and improved management of the garage.

The proposed parking plan for the Prudential Center Garage is consistent with the existing parking freeze limitation on the garage reported by the Boston Air Pollution Control Commission (BAPCC). The BAPCC reports the freeze limitation as 2,067 public spaces. As shown in Table III-57 presented above, the proposed number of public parking spaces is 1,977. The remaining 1,850 spaces are private and not available to the general public. An application for a parking freeze permit or exemption is required to increase the supply of spaces in the garage. Based on the current proposed plan, an exemption for the private spaces is required from the BAPCC.

TABLE III-58
EXISTING PARKING VS. FUTURE PARKING

	<u>Existing</u>	<u>Future</u>	<u>Increase (Decrease)</u>
<u>North Garage:</u>			
Mezzanine Level	128	120	(8)
Street Level	345	347	2
Lower Level	<u>780</u>	<u>1,129</u>	<u>349</u>
Total North	1,253	1,596	343
<u>South Garage:</u>			
Mezzanine Level	335	428	93
Street Level	394	484	90
Lower Level	<u>1,046</u>	<u>1,319</u>	<u>273</u>
Total South	1,775	2,231	456
TOTAL GARAGE	3,028	3,827	799

3.10 Public Transportation

The analysis of project impacts on public transportation focused on the impacts on the rapid transit system which is expected to carry the majority of project transit trips. An additional reason for the focus on rapid transit is that increases in system capacity are more difficult to implement than for either bus or commuter rail service. As explained in the Existing Conditions section of this report, transit capacity analysis centers on the number of passengers carried on each route's highest ridership ("peak load") segment in the dominant ("peak") direction of travel. If a proposed project significantly impacts the public transportation system, the impacts occur on these segments, even if they are far from the project site. In this section of the report, the expected future capacity of the rapid transit system is compared with forecast evening peak hour, peak direction ridership on these peak load segments.

3.10.1 Future Capacity

The Massachusetts Bay Transportation Authority (MBTA) has an ongoing program of capacity expansions and service improvements. By lengthening subway platforms and expanding vehicle fleets, the MBTA can accommodate longer trains without reducing frequency. As a result of this expansion program, the evening peak hour planning capacity of the MBTA rapid transit system is expected to increase significantly between now and 1999. By 1994, all peak hour trains on the Red and Orange lines will operate with six cars at existing frequencies. Also by 1994, average train lengths will increase to five cars on the Blue Line and to two cars on the Green Line/West. These changes increase the total planning capacity of each line as shown in Table III-59. The 1999 rapid transit capacity reflects both an increase in the number of cars per train and an increase in frequency of trains per hour. Train lengths will increase on the Green Line/West and on the Blue Line, while the Red and Orange lines will operate at higher frequencies (see Table III-60).

TABLE III-59
1994 RAPID TRANSIT LINE CAPACITY
EVENING PEAK HOUR, PEAK DIRECTION*

<u>Line/Segment</u>	<u>Average Cars/ Train</u>	<u>Average Headway (Minutes)</u>	<u>Average No. of Trains</u>	<u>Planning Capacity of Car**</u>	<u>Planning Capacity of Line</u>
<u>Red Line/North:</u> Ashmont-Alewife Braintree-Alewife	6.00	4.00	15.0	180	16,200
<u>Red Line/South:</u> Alewife-Ashmont Alewife-Braintree	6.00	3.33	18.0***	180	19,440
<u>Green Line/West:</u> Boston College Cleveland Circle Riverside Huntington Ave.	2.00	1.32	45.5	130	11,830
<u>Green Line/North:</u> Lechmere Service	2.00	8.00	7.5	130	1,950
<u>Orange Line/ North-South:</u> Oak Grove- Forest Hills	6.00	4.29	14.0	155	13,020
<u>Blue Line:</u> Bowdoin-Wonderland	5.00	3.16	19.0	110	10,450

* Based on maintaining existing headways and increasing train lengths (as planned by the MBTA).

** The MBTA uses these capacity estimates for planning purposes. Heavier loads can be carried and are often observed on the system.

*** Includes three additional six-car Braintree trains during the peak hour.

TABLE III-60
1999 RAPID TRANSIT LINE CAPACITY
EVENING PEAK HOUR, PEAK DIRECTION*

<u>Line/Segment</u>	<u>Average Cars/ Train</u>	<u>Average Headway (Minutes)</u>	<u>Average No. of Trains</u>	<u>Planning Capacity of Car**</u>	<u>Planning Capacity of Line</u>
<u>Red Line/North:</u> Ashmont-Alewife Braintree-Alewife	6.00	3.00	20.0	180	21,600
<u>Red Line/South:</u> Alewife-Ashmont Alewife-Braintree	6.00	3.00	20.0	180	21,600
<u>Green Line/West:</u> Boston College Cleveland Circle Riverside Huntington Ave.	2.42	1.32	45.5	130	14,300
<u>Green Line/North:</u> Lechmere Service	2.00	8.00	7.5	130	1,950
<u>Orange Line/ North-South:</u> Oak Grove- Forest Hills	6.00	4.00	15.0	155	13,950
<u>Blue Line:</u> Bowdoin-Wonderland	6.00	3.16	19.0	110	12,540

* Forecasts based on discussions with the MBTA Operations Department.

** The MBTA uses these capacity estimates for planning purposes. Heavier loads can be carried and are often observed on the system.

3.10.2 Background Development Trips

The rapid transit ridership projected for 1994 and 1999 No-Build conditions includes all expected increases in ridership due to projected background development, and does not include the Prudential Center Redevelopment project. The specific background development projects included in the 1994 No-Build forecast are listed in the Appendix. All major development proposals for downtown Boston, Cambridge, and surrounding areas, as well as the Back Bay developments are included in the 1994 No-Build traffic analysis. These background projects are expected to add 17,450 evening peak hour, peak direction passengers to the rapid transit system's seven peak load segments. Specific background projects for the 1994 to 1999 period are not known. The forecast of 14,600 new peak load segment passengers for that period was derived by assuming that the annual increase during the years from 1994 to 1999 is the same as the annual increase during the years from 1988 to 1994. Table III-61 outlines the increase in ridership at each peak load segment.

TABLE III-61
ADDITIONAL RIDERS DUE TO BACKGROUND DEVELOPMENT
EVENING PEAK HOUR, PEAK DIRECTION

<u>Rapid Transit Line/Direction</u> <u>(Peak Load Segment)</u>	<u>1994*</u> <u>Background</u> <u>Volumes</u>	<u>1999**</u> <u>Background</u> <u>Volumes</u>
Red Line/North (Kendall-Central)	3,100	2,600
Red Line/South (Broadway-Andrew)	4,450	3,700
Green Line/West (Arlington-Copley)	2,900	2,400
Green Line/North (Science Park-Lechmere)	250	200
Orange Line/North (Haymarket-North Station)	2,600	2,200
Orange Line/South (N.E. Medical Center-Back Bay Station)	2,500	2,100
Blue Line/North (Aquarium-Maverick)	<u>1,650</u>	<u>1,400</u>
TOTAL	17,450	14,600

* Based on transit background development projects listed in the Appendix.

** Estimated by assuming that the annual increase in passengers during the years from 1994 to 1999 is the same as the annual increase during the years from 1988 to 1994.

3.10.3 Project Transit Trip Generation

Table III-62 projects the number of peak hour transit trips generated by the new development in 1994 and 1999. A total of almost 990 new morning peak hour trips and approximately 1,210 new evening peak hour trips are expected.

TABLE III-62
1994 AND 1999 NEW TRANSIT TRIPS*

	<u>1994</u>	<u>1999</u>
<u>Morning Peak Hour</u>		
In	799	978
Out	<u>24</u>	<u>63</u>
TOTAL	823	1,041
<u>Evening Peak Hour</u>		
In	82	151
Out	<u>867</u>	<u>1,103</u>
TOTAL	949	1,254

* All modes of public transportation.

3.10.4 Trip Distribution and Assignment

The survey of Prudential Center employees taken in 1987 also provides information regarding employee residential location. The survey results indicate that 40 percent of the employees surveyed reside outside Route 128. The principal public transportation mode serving this area is commuter rail. Areas inside Route 128 are predominantly served by rapid transit and bus. Based on the survey results, an estimate of distribution by public transportation mode was made. Table III-63 shows the expected breakdown of project riders to the three modes of public transportation.

TABLE III-63
ASSIGNMENT OF PROJECT VOLUMES
TO MODES OF PUBLIC TRANSPORTATION

<u>Mode</u>	<u>Percent of Public Transportation Trips*</u>	<u>Evening Peak Hour Departing Trips</u>	
		<u>1994</u>	<u>1999</u>
Bus	14%	121	154
Commuter Rail:	(33)		
Back Bay Station	23	199	254
North Station	10	87	110
Rapid Transit	<u>53</u>	<u>460</u>	<u>585</u>
TOTAL	100%	867	1,103

* Based on the survey of Prudential Center office employees by Cambridge Systematics, Inc. (1987).

The survey results also indicate how the project rapid transit trips should be allocated to the seven peak load segments of the rapid transit system. Table III-64 indicates the percentage projected to use each rapid transit line, as well as the number of evening peak hour outbound trips expected on the peak load segments. The project riders expected to use the Green Line/West board westbound trains at the Auditorium and Prudential stations and, therefore, do not impact the peak load segment, which is from Arlington to Copley. The same result is expected for riders who board southbound Orange Line trains at Back Bay Station. These riders fill places vacated by downtown workers who alight from southbound Orange Line trains at Back Bay station to transfer to commuter rail or to walk to their destinations.

3.10.5 Project Impacts

The impact of the Prudential Center Redevelopment project on the rapid transit system's peak load segment is expected to be minor (no more than 1 percent of the planning capacity of each line). Total ridership on all peak load segments is expected to be at or below planning capacity in the evening peak hour in 1994 (see Table III-65) and in 1999 (see Table III-66).

TABLE III-64
NEW EVENING PEAK HOUR RAPID TRANSIT TRIPS
ON PEAK LOAD SEGMENTS

<u>Line Direction</u> <u>(Peak Load Segments)</u>	<u>Percent</u>	<u>Passengers</u>	
		<u>1994</u>	<u>1999</u>
Red Line/North (Kendall-Central)	11%	51	64
Red Line/South (Broadway-Andrew)	30	138	176
Green Line/West (Arlington-Copley)	26	0*	0*
Green Line/North (Science Park-Lechmere)	4	18	23
Orange Line/North (Haymarket-North Station)	7	32**	41**
Orange Line/South (N.E. Medical Center-Back Bay Station)	15	0***	0***
Blue Line/North (Aquarium-Maverick)	<u>7</u>	<u>32</u>	<u>41</u>
TOTAL	100%	271	345

* The riders expected to use the Green Line/West (120 in 1994 and 149 in 1999) board westbound trains at the Auditorium and Prudential Center stations and, therefore, do not impact the peak load segment.

** The passengers using North Station commuter rail lines (87 in 1994 and 108 in 1999) are also expected to impact the peak load segment of the Orange Line/North.

*** The riders expected to use the Orange Line/South (69 in 1994 and 85 in 1999) board southbound trains at Back Bay Station and, therefore, do not impact the peak load segment.

TABLE III-65
1994 RAPID TRANSIT RIDERSHIP AND CAPACITY
EVENING PEAK HOUR

<u>Line/ Segment</u>	<u>1994 Planning Capacity</u>	<u>1994 No-Build</u>		<u>1994 Build</u>	
		<u>Ridership</u>	<u>Percent of Capacity</u>	<u>Ridership</u>	<u>Percent of Capacity</u>
Red/North	16,200	11,200	69%	11,250	69%
Red/South	19,440	17,200	88	17,340	89
Green/West	11,830	11,800	100	11,800	100
Green/North	1,950	1,500	77	1,520	78
Orange/North	13,020	11,500	88	11,620	89
Orange/South	13,020	10,150	78	10,150	78
Blue/North	10,450	7,900	76	7,930	76

TABLE III-66
1999 RAPID TRANSIT RIDERSHIP AND CAPACITY
EVENING PEAK HOUR

<u>Line/ Segment</u>	<u>1994 Planning Capacity</u>	<u>1994 No-Build</u>		<u>1994 Build</u>	
		<u>Ridership</u>	<u>Percent of Capacity</u>	<u>Ridership</u>	<u>Percent of Capacity</u>
Red/North	21,600	13,800	64%	13,865	64%
Red/South	21,600	20,900	97	21,070	98
Green/West	14,300	14,200	99	14,200	99
Green/North	1,950	1,700	87	1,725	88
Orange/North	13,950	13,700	98	13,850	99
Orange/South	13,950	12,250	88	12,250	88
Blue/North	12,540	9,300	74	9,340	74

Impacts on the commuter rail and bus systems are likewise expected to be minor. During the evening peak hour, approximately 360 new commuter rail riders and approximately 150 new bus riders are expected to depart from the site at Full-Build. These volumes, which are likely to be in the range of 1 percent of 1999 service capacity, correspond to the capacity of three rail coaches and three buses, respectively.

3.10.6 Transit Impacts of Traffic Reduction Measures

The mitigation section of this report includes strategies intended to discourage commuting alone by automobile and to encourage the use of other transportation modes, including ridesharing, walking, and public transportation. These strategies are applied to the existing development on the site, as well as the proposed development.

If the goals of the traffic mitigation program are met, the outbound evening peak hour transit volume increases by 229 trips, or almost 8 percent over unmitigated transit volumes. This results in an increase of 121 rapid transit trips, 76 commuter rail trips, and 32 bus trips, which is considered an insignificant increase in transit system ridership. The transit increase is associated with the decrease of 248 outbound vehicle trips resulting from the traffic mitigation program.

3.11 Pedestrian Access





3.11.1 Proposed Pedestrian Plan

The Prudential Center Redevelopment provides a greatly enhanced pedestrian environment. The major central walking paths are covered with roofs and, therefore, are climate controlled. Much of the pedestrian area is also lined with stores and shop fronts creating new city streets. Pedestrian ways vary in width from 30- to 50-feet, with large public squares or courtyards at their intersections. The proposed pedestrian pathways are shown in Figure III-37.

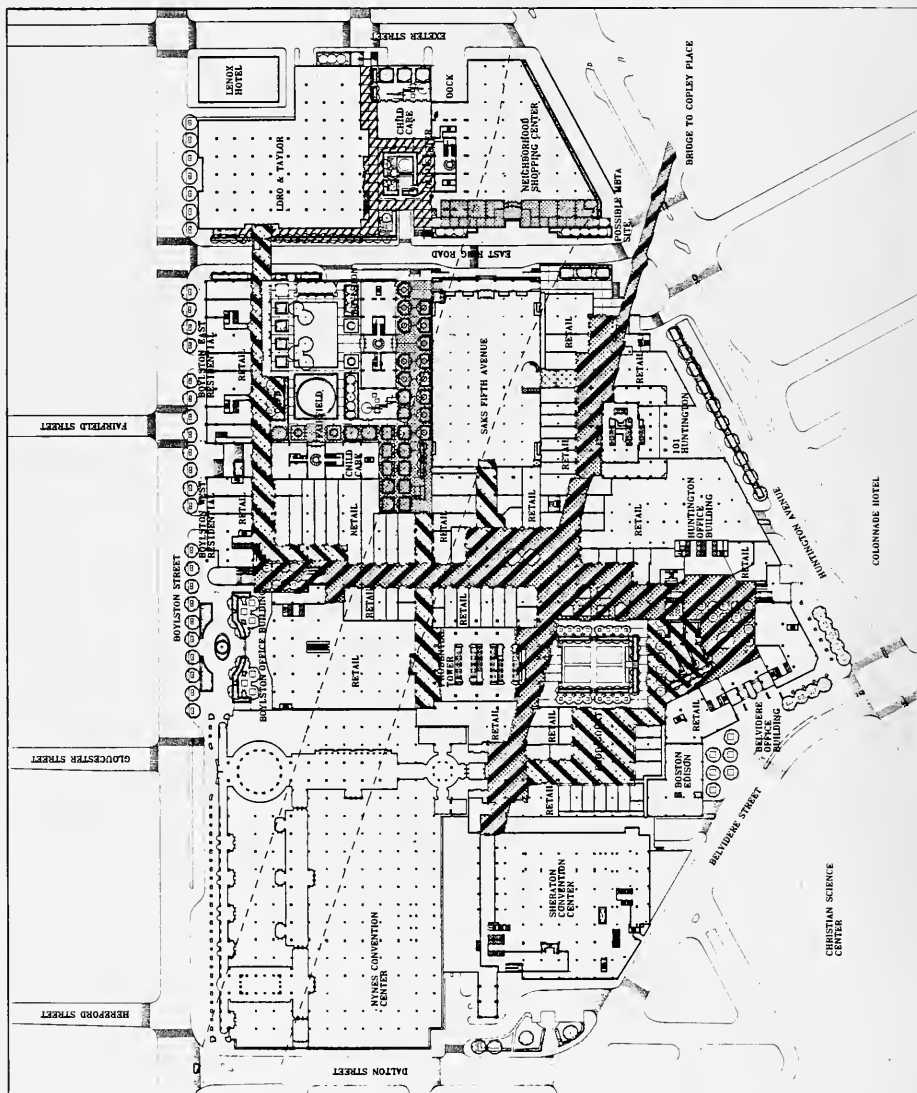
Prudential Center Redevelopment

Fig. III-37 Future Pedestrian Corridors

LEGEND:

-  Covered Corridors
-  Enclosed Corridors
Open for Business
Hours Only
-  Enclosed Corridors
Open 24 Hours
-  Open Corridors

0 200 400
Scale: feet



Pedestrian access to and through the Prudential Center from the surrounding areas is expanded and enhanced. A major north/south corridor passes east of the Prudential Tower, similar to the way it is today. This corridor provides access to the Prudential Tower and the retail space along the path, and links Boylston Street with Huntington Avenue. Another north/south corridor passes west of the Prudential Tower linking Belvidere Street near Huntington Avenue with Boylston Street via the Hynes Convention Center. The third major north/south corridor is along East Ring Road. Sidewalks on East Ring Road are widened to accommodate future pedestrian usage while the road itself is narrowed. Portions of the sidewalk on the west side of East Ring Road is widened to approximately 5-feet making it usable for pedestrians. The location of a new supermarket on East Ring Road draws pedestrians along the road from both the Back Bay and from the South End.

Three major east/west pedestrian corridors are provided through the Prudential Center as well. Extending from the Copley Place footbridge, a corridor provides direct access to 101 Huntington Avenue and the Prudential Tower. It also crosses all three north/south corridors and provides a direct link with the Hynes Convention Center and Sheraton Hotel, through which access can be gained to Dalton Street. A second corridor provides access to the north side of the Prudential Tower and the proposed retail area from Exeter Street across from Blagden Street. It passes alongside the Saks Fifth Avenue store and through the middle of the expanded retail area. The third east/west corridor connects Lord & Taylor at East Ring Road with the proposed Boylston Street office building and the Winter Garden.

The location of new buildings under the Alternative A Build condition affects pedestrian flow and access across the Prudential Center. Two residential buildings and one office building are proposed for the north side of the Prudential Center on Boylston Street. The two residential buildings are located on the east side of the Prudential Tower, while the office building abuts the Hynes Convention Center and is slightly set back from Boylston Street. On the south side, two office buildings are slated for construction. One office building is built on the corner of Huntington Avenue and Belvidere Street. The other office building is on Huntington Avenue

just west of the 101 Huntington Avenue office building. The two office buildings are separated by the main north/south pedestrian corridor passing just east of the Prudential Tower. Additionally, a new supermarket is above the Turnpike between East Ring Road and Exeter Street at Huntington Avenue. The new supermarket is shown in Figure III-37. East Ring Road is the main pedestrian access to the supermarket. All of the new buildings have pedestrian access to the remainder of the Prudential Center and surrounding areas via the corridors described above.

In addition to future buildings and pedestrian corridors, there also are other Prudential Center Redevelopment modifications that impact pedestrian flow and access. At the corner of Huntington Avenue and Belvidere Street, the entrance to the MBTA Prudential Green Line Station is relocated within an arcade associated with the new office building at the Belvidere Street and Huntington Avenue intersection. This provides pedestrians overhead shelter and a direct connection to pedestrian corridors within the Prudential Center from this branch of the Green Line. A further improvement results from the closure of South and North Ring roads which reduce pedestrian and vehicular conflicts within the Prudential Center. The closure of North and South Ring roads not only improve pedestrian safety at these locations, but also decrease delays for pedestrians who previously had to wait for a gap in traffic to cross these roads.

3.11.2 Future Pedestrian Trip Generation

Walk trips generated by the future project were estimated using rates based on surveys conducted in 1987 by Cambridge Systematics, Inc. in association with HMM Associates, Inc. Trip generation surveys conducted by Vanasse Hangen Brustlin, Inc. were also used to supplement information about future travel demand characteristics. Trip generation rates for walk trips are shown in section 3.1.1, Office and Retail Trip Generation, presented previously. Non-work trips made by workers were excluded from the trip rates, while visitor trips were included. Employee non-work trips are not needed to calculate peak hour trips because employee non-work trips are generally not made during peak hours. The resulting trip generation rates were then used to calculate pedestrian trips.

Net new project pedestrian trips are shown in Table III-67 and are divided into transit trips and walk trips. Transit trips involve some form of public transportation in conjunction with walking between the site and transit stop. Walk trips are those trips that are made entirely on foot with no other mode of transportation. In 1994 during the morning peak hour, the project is expected to generate approximately 1,000 total pedestrian trips. In evening peak hour, the project is expected to generate about 1,250 total pedestrian trips.

In 1999 in the morning peak hour, the project is expected to generate approximately 1,200 total pedestrian trips. During the evening peak hour, the project is expected to generate about 1,800 total pedestrian trips.

TABLE III-67
NET NEW PROJECT PEDESTRIAN TRIPS

	<u>1994</u>		<u>1999</u>	
	<u>Transit</u>	<u>Walk</u>	<u>Transit</u>	<u>Walk</u>
<u>Morning Peak</u>				
In	799	116	953	186
Out	<u>24</u>	<u>20</u>	<u>34</u>	<u>77</u>
TOTAL	823	136	987	263
<u>Evening Peak</u>				
In	82	81	128	176
Out	<u>867</u>	<u>234</u>	<u>1,079</u>	<u>401</u>
TOTAL	949	315	1,207	577

3.11.3 Future Pedestrian Distribution and Assignment

The pedestrian trips generated by the proposed project are assigned specific routes to and from the site. Assignment and distribution of future pedestrian trips is done individually for transit trips and walk trips. For future transit pedestrian trips, distribution and assignment is based on the number of transit riders expected to use each station or stop as discussed

previously in the Public Transportation section. For future walk trips, distribution and assignment is based on pedestrian patterns observed under existing conditions. Existing counts are analyzed to determine pedestrian usage at each study location. These existing pedestrian trends are applied to expected future pedestrian trips in the peak hour. Additionally, future pedestrian corridors are considered with respect to assignment. While distribution of future walkers is expected to remain much as it is today, the paths pedestrians choose in the future may be somewhat different. Future pedestrians are assigned with the new corridors in place.

3.11.4 Future Pedestrian Volumes

Future pedestrian volumes are developed by adding existing pedestrian volumes to background development and Prudential Center Redevelopment volumes. Background pedestrian volumes are calculated by applying the same trip generation rates used for the future project to other projects in the area with expected 1994 completion dates. The Hynes Convention Center was not considered for future conditions because it was fully operational at the time of the existing pedestrian counts. The American Society for Industrial Security (5,000 attendees) and the American Association of Oral Surgeons (5,000 attendees) were two conferences in progress at the Hynes Convention Center during the time of the pedestrian counts.

3.11.5 Future Pedestrian Level-of-Service Analysis

A level-of-service (LOS) analysis was conducted for the 1999 evening peak hour. This scenario was analyzed because the highest pedestrian volumes generated by the project are expected to occur in the 1999 evening peak hour. Additionally, at most locations under existing conditions, the evening peak hour generally has a worse level of service than the morning or midday peak hour. Furthermore, using the future pedestrian distribution and assignment method described above, a sensitivity analysis was done for all other 1994 and 1999 future conditions. The analysis indicates that the volumes associated with these scenarios do not significantly impact the level of service at any location. All analysis locations were examined,

but only those locations at LOS C or worse under existing conditions were analyzed. All other locations should remain at LOS C or better under future scenarios. The level-of-service analysis was performed using procedures previously described in the Existing Conditions section of this report.

Table III-68 shows pedestrian evening peak hour level-of-service results for locations analyzed under existing conditions and 1999 Build conditions. Under average conditions, all locations continue to operate at LOS C or better for the evening peak hour 1999 Build scenario. For surge conditions, all locations continue to operate at acceptable levels of service (D or better) under the evening peak hour 1999 Build condition. A surge condition (called platooning) occurs when pedestrians cross a street as a group after waiting for a signal. Two locations, however, begin to approach unacceptable levels of service for the surge condition under the evening peak hour 1999 Build scenario. At Exeter Street, north of Boylston Street, level of service may deteriorate to LOS D under surge conditions. At the Prudential footbridge over Huntington Avenue, LOS D is expected for the surge condition. This condition, however, should improve with the removal of the revolving doors at both ends of the footbridge.

The analysis of 1999 Build conditions includes the intersection of Huntington Avenue and East Ring Road. This was analyzed because of the relocation of the expanded supermarket to the corner of East Ring Road and Huntington Avenue. The pedestrian analysis at the intersection includes volume increases from background development and the additional uses at the Prudential Center, as well as additional volume at the intersection due to the relocation of the supermarket. The projected level of service under surge conditions is LOS C. Possible changes to the intersection will be considered as part of the design of access to the South Garage from Huntington Avenue. Any proposed changes will be analyzed for impacts on both vehicular and pedestrian traffic.

Future pedestrian traffic generated by the Prudential Redevelopment Center is not expected to adversely impact any analysis location. In the future, all locations are expected to remain at acceptable levels of service for both average and surge conditions.

3.12 Construction Impacts

This section details the construction period impacts of the project on traffic. It focuses mainly on construction-related truck movements and construction employee trips. To analyze these impacts, Vanasse Hangen Brustlin obtained the following data from the Perini Corporation:

- o Schedule of activities
- o Number of workers per month
- o Average number of workers per day (derived by dividing the number of workers for a particular month by the number of days in the month)
- o Number of truck loads per month
- o Average truck loads per day (derived by dividing the number of truck loads for a particular month by the number of work days in the month)

Prudential Center Redevelopment construction is scheduled to begin in January 1990 and end by September 1996. The construction is planned in seven phases. The different phases and their start and end dates are given in Table III-69. It should be noted that several phases overlap, therefore, the trucking activity and the number of workers at the site at any time will be the sum for all overlapping phases.

3.12.1 Truck Movements during Construction

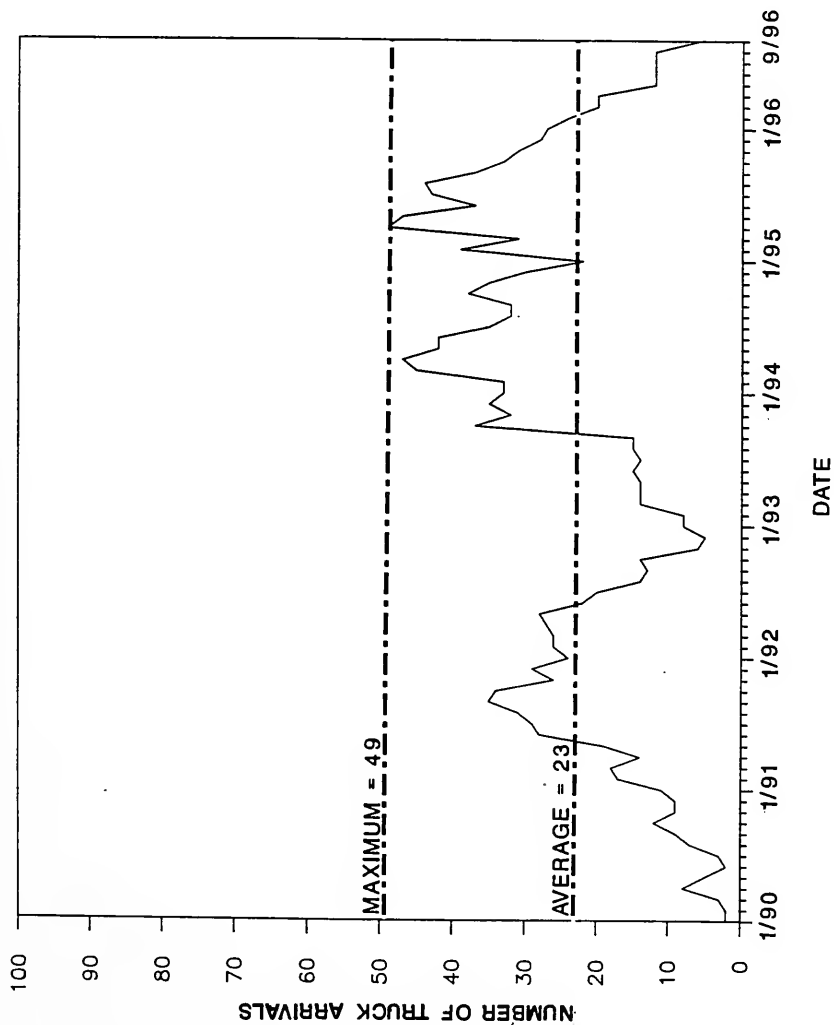
Trucks are needed to remove material excavated from the site and to deliver new construction materials as the project proceeds. As might be expected, truck traffic varies considerably throughout the construction period. Figure III-38 shows the variation in the number of truck loads per day by month during the period of construction.

TABLE III-69
ALTERNATE A CONSTRUCTION SCHEDULES

<u>Phase/Subphase</u>	<u>Start Date</u>	<u>End Date</u>
1. Food Court	January 1990	October 1991
2. Huntington Office and Retail/Common	October 1990 February 1991	December 1993 July 1992
3. Star Market	June 1991	October 1992
4. Belvidere Office	May 1993	January 1995
5. Boylston Residence and Retail/Common	October 1992 September 1993	December 1994 April 1995
6. Office Boylston and Retail/Common	March 1994 April 1995	September 1996 August 1996
7. East Boylston Residence	July 1994	April 1996

Prudential
Center
Redevelopment

Fig. III-38
Construction
Truck Arrival
Per Day By Month



The Prudential Center construction is expected to generate a minimum of two trucks per day and a maximum of forty-nine trucks per day. The average number of trucks per day for the entire construction period is twenty-three. Forty-one months out of a total of eighty-one months of construction have less than the projected average number of trucks per day. Peak trucking activity is expected late in the construction period in April 1995.

The impacts of construction trucks in the evening peak hour is expected to be insignificant because most deliveries are completed prior to the end of the typical construction work day (3:30 PM). The truck activity is expected to be uniformly distributed throughout the work day. Thus, a maximum of forty-nine truck trips per day to the Prudential Center construction site translates to approximately six trucks per hour if distributed over an eight-hour day. The impact of construction trucks is expected to be minor, as, at most, six truck trips are expected in the morning peak hour.

Trucks coming to and from the site are required to use major arterial roadways or highways and not local streets. The designated truck routes are shown in Figures III-39A and III-39B, and are listed in the Construction Impacts section of Volume V, Environmental Impacts. The selection of proposed truck routes is based on the following criteria:

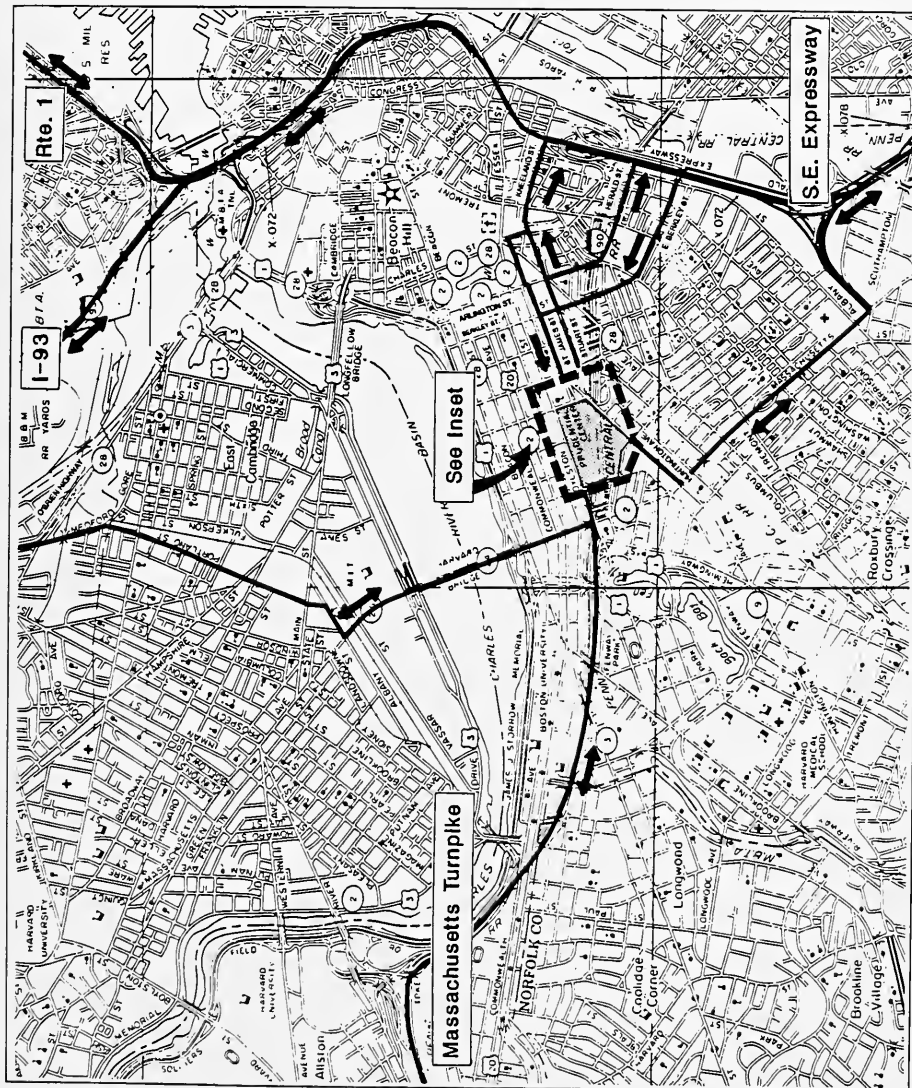
- o Keeping trucks out of residential neighborhoods in the Back Bay and South End
- o Designating specific roads where trucks are permitted
- o Providing access to and from the major arteries--Route 1, I-93, Massachusetts Turnpike, and Southeast Expressway (I-93 south)--into metropolitan Boston

The proposed truck routes minimize the impact of construction trucks on the neighborhoods.

Prudential Center Redevelopment

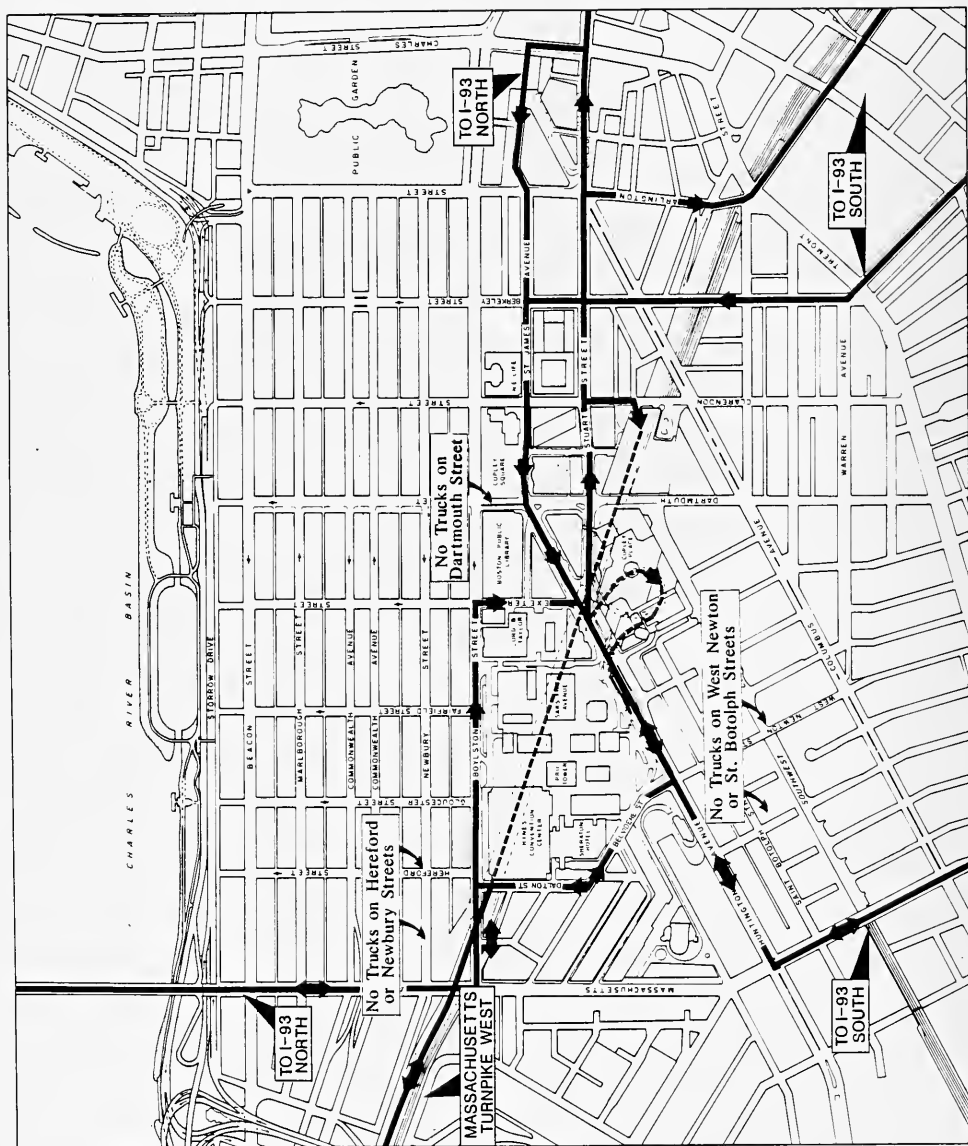
**Fig. III-39A
Designated
Truck Routes**

0 700 1400
Scale: Feet



Prudential Center Redevelopment

Fig. III-39B Designated Truck Routes



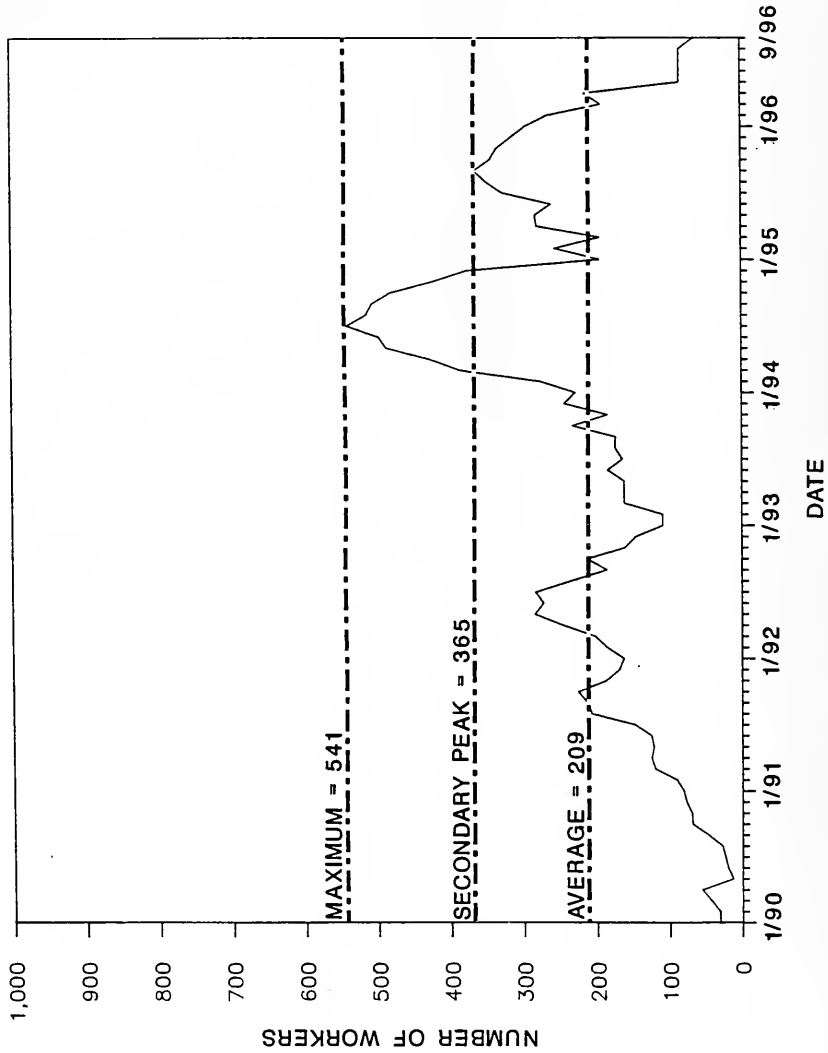
3.12.2 Construction Employee Trip Generation

Trip generation by construction workers is directly related to the number of workers. Figure III-40 shows the variation in the number of workers per day during the period of construction. Note that the number of workers per day varies considerably during the period of construction. The minimum number of workers per day is thirteen and the maximum number of workers per day is 541. The average number of workers per day for the entire construction period is 209. Forty-six months out of eighty-one months have less than the average (209) workers per day. According to the schedule, the number of workers per day reaches a peak during August 1994. Although the peak number of workers per day is 541, it should be noted that the secondary peak number of workers per day is 365. Only ten months out of the total of eighty-one months of construction are expected to have greater than 365 workers per day.

There is no special parking provided for construction workers. Workers have to park at the available facilities in the area at current costs. Given the high cost of parking, it is unlikely that all workers would drive to work alone. Many will use public transportation due to the location of the site and its excellent accessibility via transit. Others will likely carpool to share parking costs. In addition to these factors, construction workers generally travel before the peak commuting hours (working 7:00 AM to 3:30 PM). As a result, only minor impacts to the area roadway system during peak commuting hours are anticipated due to construction worker vehicle trips.

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Fig. III-40
Construction
Workers Per Day
By Month



4. TRANSPORTATION MITIGATION PLAN

4.1 Introduction

To minimize and reduce the potential impacts of the Prudential Center Redevelopment project, an extensive transportation mitigation plan has been developed. Completed in accordance with the City of Boston's Transportation Access Plan requirements, all of the required elements have been addressed. The goal of the Prudential Property Company is to develop a complete, thorough, and exemplary mitigation plan for this important project. As a result, many elements of the plan represent new commitments never before made by other developers in Boston.

The Prudential Property Company recognized early in the planning of this project that there are significant opportunities to mitigate transportation impacts from the existing 4.5 million gross square feet (gsf) of development at the Prudential Center, as well as from the proposed 1.8 million gsf of the redevelopment. To begin addressing the traffic impacts of both the existing Prudential Center and the Prudential Center Redevelopment, Prudential has initiated an aggressive transportation management planning process for the existing Prudential Center. The developer is entering into an agreement with the City of Boston to establish a Commuter Mobility Program on the site. This program is in its early stages of development and the Prudential Property Company is proud of the fact that it is among the first developers in the city to participate in this important program.

The many strategies described in this section reflect the fact that the Prudential Property Company clearly understands that the specific commitments outlined herein will be included in a legally binding Transportation Access Plan (TAP) agreement between the developer and the City of Boston.

Each strategy has been classified into one of the following categories:

- o Travel demand management improvements
- o Public transportation improvements
- o Parking management

- o Access/circulation design
- o Traffic operations
- o Loading improvements
- o Pedestrian improvements
- o Construction traffic management
- o General

The following sections briefly describe each mitigation measure, define responsibility for implementing the measure, and discuss the measure's current status.

4.2 Travel Demand Management Improvements

Reducing the amount of traffic generated by the existing Prudential Center and the Prudential Center Redevelopment project is a key component of the mitigation plan. The Prudential Property Company understands the community's concern over possible traffic impacts and has developed an extensive series of travel demand reduction strategies to reduce the existing Prudential Center's impacts, as well as those of the redevelopment project. When integrated into a comprehensive transportation management plan that includes all nine types of strategies listed above, travel demand management can reduce automobile usage and, thereby, lessen the need for physical improvements to roadways and the need for the construction of additional parking. The following measures are designed to reduce the number of vehicle trips to the project area during peak commuting hours and on a daily basis.

4.2.1 Establish A Transportation Coordinator Position

First and foremost in the Transportation Mitigation Plan is the creation of a Transportation Coordinator position responsible for both the existing Prudential Center and the Prudential Center Redevelopment. In September 1988, the Prudential Property Company created and filled the full-time position of Transportation Coordinator. This person is responsible to address the Prudential Center's transportation plan on a pro-active basis, including identifying and

responding to all transportation-related issues and concerns. The major, specific objective is to implement measures that minimize automobile use to and from the Prudential Center as described in this mitigation section. Activities toward this objective include, but are not limited to, the following:

- o Establish and implement the Commuter Mobility Program at the Prudential Center
- o Coordinate all ridesharing (car and vanpooling) activities, including implementation of a computerized ride-matching service
- o Promote transportation options through periodic newsletters, special events, publicity, and tenant relations
- o Improve and expand the MBTA's on-site pass sales program
- o Encourage tenants to implement alternative work schedules to spread peak-hour travel
- o Work with the management of the Prudential Center Garage on all parking management issues
- o Participate in the establishment of access plan goals, monitor efforts, and submit annual reports to the city on compliance levels and mitigation effectiveness
- o Provide up-to-date information on services, schedules, fares, etc. for Prudential tenants, residents, and shoppers
- o Act as Prudential's main contact person for all outside agencies and groups on transportation matters

4.2.2 Promote Ridesharing

Ridesharing, where commuters participate in carpools and vanpools, decreases the number of vehicles using area roadways and, thereby, reduces congestion, air pollution, and fuel consumption. The developer is strongly committed to a number of ridesharing incentives which are described below.

4.2.3 Implement a Computerized Rideshare Program

The Commonwealth of Massachusetts, through the funding of a private, non-profit corporation (CARAVAN for Commuters, Inc.), has developed a computerized transportation ride-matching network called RideSource. RideSource matches commuters to carpools, vanpools, and public transportation options through an extensive database developed by CARAVAN. Prudential has recently installed the program's software and is in the process of developing the database for existing project tenants with the assistance and support of CARAVAN. This computerized tool greatly assists in the formation of new carpools and vanpools by making data available to all current employees at the existing Prudential Center about the residence location and travel times of other commuters who might share a ride. The program will be expanded to include other area businesses and, in the future, will include employees in the proposed buildings.

To further encourage the use of vanpools, tenants will be informed about the advantages of vanpools and the opportunities to support them through CARAVAN and other similar programs. Designated parking areas for vanpools will be identified. In addition, one or two designated boarding and drop-off areas will be established as necessary to serve the Prudential Center. If the demand exists from users off-site, these vans will also be accommodated. A vanpool boarding area has recently been established on South Ring Road; however, new locations will be necessary within the Prudential Center Redevelopment when construction begins on South Ring Road. The developer is committed to maintaining curbside vanpool boarding space, both now and in the future, and will continue to work cooperatively with the BTB on this issue.

4.2.4 Establish Public Awareness Program on Transportation Options

In addition to participation in the RideSource matching program, the developer will disseminate an extensive amount of promotional materials on ridesharing for all Prudential Center employees through a comprehensive public awareness campaign. This program is primarily the responsibility of the Transportation Coordinator and includes a regularly published and distributed newsletter addressing ridesharing and other opportunities to reduce vehicular travel demand. In addition, a transportation orientation program is being developed for all new employees and residents of the Prudential Center.

4.2.5 Establish a Preferential Parking Program

The Prudential Property Company is committed to supporting carpools and vanpools by establishing a preferential parking program for these vehicles. Space is currently available within the North and South garages on-site to accommodate a significant increase in these types of vehicles. Approximately twenty vanpool parking spaces are provided initially in the garage and additional spaces will be designated as needed. Prudential also intends to provide a 25 percent discount for vanpool parking spaces, creating an even greater incentive to use this mode of travel.

4.2.6 Encourage Existing Prudential Center Employers to Assist in the Implementing of the Mitigation Plan

Prudential's Transportation Coordinator has contacted existing Prudential Center employers regarding the implementation of the mitigation plan. The developer realizes that this is a unique project in that there are existing tenants in the site's buildings who are key participants in the transportation management process. The success of the Commuter Mobility Program and Transportation Mitigation Plan depends not only on the tenants of the new development, but also on the success of integrating existing tenants into the plan. The opportunities for a successful approach appear to be quite good since there are major tenants (Gillette, Boston Edison, and New England Telephone) that account for over 50 percent of the office space in the existing Prudential Center.

4.2.7 Promote Usage and Availability of Public Transportation Services

An effective way to reduce the number of vehicles on the roadways serving the site is to strongly encourage employees to use public transportation as an alternate means of traveling to work. The project site is well served by public transportation with the MBTA Green Line, the Orange Line, Commuter Rail (Purple Line), AMTRAK service, and express bus service--all located within easy walking distance. The site's location provides an excellent opportunity for the project to generate an even higher proportion of public transportation users. The proponent encourages and promotes transit usage through several measures described below.

4.2.8 Provide Information About Transit Services

Continually upgraded information on traveling to the site from cities and towns in the region, as well as from Logan Airport, by public transportation will be provided to tenants, shoppers, and residents of the project. Prudential is preparing a transportation brochure in cooperation with the Boston Transportation Department for public dissemination beginning in the second quarter of 1989. The brochure highlights public transportation, including information about station locations, fares, and schedules.

4.2.9 Improve On-site Sales of Transit Passes

A new on-site location that sells MBTA transit and commuter rail passes to employees, shoppers, the community, and Prudential residents will be in place by May 1, 1989. At the present time, monthly T passes are sold at the Post Office located in the lower lobby of the Prudential Tower. Plans are to supplement this function by selling both T passes and commuter rail passes at the Greater Boston Convention and Visitors Bureau information center located in a highly visible location on the main retail level of the Prudential Center. Expanded hours and days of operation will enhance the convenience of this additional site. Commuter rail passes will be sold in the new location starting late spring 1989.

4.2.10 Encourage Transit Pass Subsidies

Another major element of the Mitigation Plan encourages tenants of the Prudential Center (both existing and future) to provide transit pass subsidies for their employees. To set an example, Prudential Insurance Company employees (based in the Prudential Center complex) will receive a 20-25 percent subsidy of monthly MBTA passes starting in January 1990. The developer will attempt to obtain commitments from future tenants regarding subsidies of MBTA passes for their employees. To do this, the Prudential Property Company is preparing an exhibit for inclusion in all future lease negotiations. The exhibit encourages each tenant to adopt this type of subsidy program, as well as other demand reduction strategies. The developer's goal is to bring another 300 employees into the program over the next twelve months.

4.2.11 Sponsor Semi-Annual Transportation Awareness Day

To promote the use of alternate means of travel to the site, Prudential is planning a "Transportation Awareness Day," to be held semiannually. The first Transportation Awareness Day is planned for April 19, 1989. This event will take place in the lobby of the Prudential Tower and includes exhibits, special displays, promotional materials, and video presentations on alternative transportation services available to people traveling to the Prudential Center. Information will also be provided on carpooling, vanpooling, and public transportation. Prudential is working with the MBTA, the BTD, CARAVAN and the MTA in planning the event. To stimulate interest in the Transportation Awareness Day, the developer intends to offer several raffle prizes for individuals who complete a short commute survey that will serve as input to the RideSource program. An outline of the day's events is presented in the Transportation Appendix.

4.2.12 Promote Bicycle Transportation

The developer recognizes the positive (though minimal) traffic reduction benefits from encouraging the use of bicycle transportation for traveling to the project. As a result, the existing program of accommodating cyclists will be expanded and improved. Presently, cyclists leave

their bikes in designated areas under the escalators on either the Boylston Street or the Huntington Avenue sides of the project and in the loading dock area serving the Prudential Tower building. The Prudential Center Redevelopment plan establishes new areas that make cyclists more comfortable leaving their bikes and, thereby, may increase the use of this mode of transportation. Providing bike lockers that can be rented through the parking garage operator is one possible option. These new locations are also in proximity to security staff or parking attendants to provide added security.

4.2.13 Offer Alternative Work Schedules

Alternative work schedules offer a means of reducing peak hour travel demands on the roadway and transit systems by shifting travel to non-peak periods or by reducing the total number of trips made per week. The major schedule alternatives are:

- o Staggered work hours - Generally set up in such a way as to assign groups of employees staggered starting times, typically at 15-minute intervals, spread over a one or two-hour period.
- o Flexible work hours (flextime) - Allow employees to choose their own starting and finishing times, as long as they are present during the central part of the day (called core time).
- o Compressed work week - Involves shifting some workers from a standard five days per week, eight hours per day schedule to fewer days of longer hours (e.g., four days per week, ten hours per day).

The developer has agreed to implement the following measures in the alternative work schedule category:

- o Encourage all existing and new employers to establish or expand existing alternative work hours programs. Several existing employers already participate in such programs, including Gillette and Boston Edison. The implementation of further

changes is currently under discussion with other existing tenants.

- o Provide extended building service hours throughout the Prudential Center. Hours of operation in the two existing office buildings are from 7:00 AM to 6:00 PM, including full elevator service and HVAC services. The existing program will be extended to cover the new buildings, resulting in a continued distribution of peak period transportation impacts. Further, the Prudential Property Company will expand these hours to begin at 6:30 AM, with full elevator service provided.

4.3 Public Transportation Improvements

Several improvements are recommended that enhance access to public transportation for Prudential Center tenants, employees, and visitors. These enhancements are designed to increase the percentage of trips made via public transportation to the site by making use of these systems easier and more attractive.

4.3.1 Improve Pedestrian Access to the Prudential and Back Bay Stations from the Complex

An important element of the overall Mitigation Plan for the Prudential Center Redevelopment is to upgrade, to the greatest extent feasible, connections to area public transportation facilities. It has been the developer's goal to improve access to the Prudential station on the Green Line by physically integrating the station into the project site. This improvement benefits commuters, shoppers, and area residents by making it possible to directly enter the project site without being subjected to inclement weather. This type of improvement has been viewed as a major goal of the city over the past several years and is a public benefit to all, not just for the redevelopment of the Prudential Center.

Similarly, another major goal of the project is to improve pedestrian connections to Back Bay Station. As described in the Urban Design volume of this report, this is accomplished through a better design solution to the linkage than presently exists. Pedestrian circulation is removed from the Prudential Tower lobby, thereby, separating office pedestrian traffic from other uses. Also, a more direct route from the Sheraton Hotel/Hynes Convention Center entrances to the Copley Place pedestrian footbridge at Huntington Avenue is provided. A more comfortable, climate controlled, and attractive pedestrian environment is created along this entire route which provides improved connections to Back Bay Station. This pedestrian route is identified through signage, simplifying its use by pedestrians.

To ease the movement of MBTA passengers and others between the Prudential Center and Back Bay Station, the developer will work with the management of Copley Place to investigate replacing the revolving doors at either end of the Huntington Avenue footbridge with conventional doors that can be left open during busy periods. It is also recommended that the MBTA work with Copley Place management to investigate the feasibility of implementing the following measures to improve the Copley Place entrance to Back Bay Station:

- o Increase the capacity of the escalators connecting Dartmouth Street with the mall level of Copley Place (e.g., through increased escalator speed or a wider escalator)
- o Provide an "up" escalator at each end of the pedestrian tunnel under Dartmouth Street
- o Provide turnstile equipment to allow passengers with tokens or passes to enter the Orange Line platform directly from the pedestrian tunnel without having to ascend the stairs to the station lobby as is currently the case
- o Improve signage within the station to encourage passengers to use the pedestrian tunnel rather than crossing Dartmouth Street at grade

4.3.2 Enhance Pedestrian Access to the Green Line at the Auditorium Station in Cooperation with the MBTA

The developer strongly supports improving signage and pedestrian access at the Green Line Auditorium station from Boylston Street because it will make pedestrian access to the station more attractive and more convenient. It is recommended that the MBTA upgrade and reopen the Boylston Street entrance (adjacent to the Division Sixteen restaurant) as a full-service entrance. In recent years, it has served only as a peak period exit and was closed entirely in early 1988 due to concerns about passenger safety in this unattended part of the station. The result is that passengers are forced to walk an extra 500-feet to enter or exit the station from Massachusetts Avenue (near Tower Records). This additional distance makes the journey less convenient and discourages people from using this station.

The MBTA could reopen the Boylston Street entrance by providing either an attendant or closed-circuit monitoring equipment and fare-evasion-proof turnstiles as described in the Existing Conditions section of this report. The latter solution allows a direct exit to Boylston Street for all passengers and a direct entrance for passengers with tokens or passes. Closed-circuit monitoring is used by the MBTA in other locations to address concerns about passenger safety. Also, improved signage should be installed to make the Auditorium station more visible from Boylston Street.

4.3.3 Address the Problem of Uneven Passenger Loads on the MBTA Green and Orange Lines

Although the Green Line and Orange Line have adequate capacity to handle peak hour volumes, individual trains are often overloaded due to surges in demand or gaps in service. This problem could be addressed (at no additional cost to the MBTA) by linking available cars into fewer, longer trains and by using signs and announcements to encourage passengers to spread out along the platforms. Vanasse Hangen Brustlin, Inc. suggests that the MBTA investigate operating all peak hour Orange Line trains with six cars and all peak hour Green Line

trains with at least two cars. The longer trains will be better equipped to accommodate passenger surges without significantly increasing platform waiting times.

4.4 Parking Management

A major feature of the Prudential Center Redevelopment mitigation program is the implementation of strategies to manage the Prudential Center's parking facility in a manner that supports the other elements of the mitigation program. In particular, this involves implementing the many mitigation measures that discourage workers, shoppers, and visitors from driving alone. As stated earlier, some of these measures are establishing vanpool and carpool programs, discouraging all-day parking with pricing policies, and changing the operation and layout of the garage to provide additional spaces to satisfy the additional demand. The developer's intent is to provide adequate parking for those who must drive to the site, while at the same time providing incentives for those who can rideshare or use public transportation.

4.4.1 Develop a Strategy to Reduce Parking Demand by Reducing Commitments to Existing and Future Tenants

The Prudential Property Company is developing a strategy to reduce commitments to tenants for monthly parking spaces in the Prudential Center Garage. The developer will also attempt to reduce parking commitments to existing tenants when their leases expire or are renegotiated, or when a tenant expresses interest in reducing their supply of parking. Although renegotiating a lease with reduced parking will be a sensitive item, especially for long-time tenants, the developer recognizes it should take this action to accommodate the additional parking generated by the proposed development.

4.4.2 Reorganize the Prudential Center Garage Supply and Operations

The physical layout of the Prudential Center Garage has undergone a detailed operational analysis to identify ways to increase the supply of parking. A comprehensive program that includes several major changes to current garage operations has been developed. Simply

restriping the garage and keeping it as a self-parking facility does not offer significant improvements due to the column spacing.

The proposed parking management plan for the Prudential Center Garage includes implementing attendant or valet, stacked, and tandem parking programs in various locations throughout the garage. The result of these programs is that more parking will be provided than currently exists through the use of these techniques. Valet parking is proposed in several areas, including the Sheraton Hotel parking on the lower level of the South Garage and several other locations in the garage. Stacked or tandem parking (facilitated in some areas through restriping) provides more spaces within a specified area because less room is needed for aisles and circulation. All totaled, the proposed changes result in an increase of approximately 800 spaces over current levels. While this increase does not address the entire deficit identified previously, it goes a long way towards solving the project's anticipated future parking needs.

As another way to address the projected parking shortfall, the concept of shared parking has been investigated. Because several areas of the garage are used exclusively for residential parking, vacant spaces exist during the daytime hours when many apartment residents are themselves at work or otherwise not at the Prudential Center. With shared parking, designated individuals are assigned to park in these areas during daytime hours. The result is an increase in the utilization levels of these spaces. To ensure adequate security, these spaces are controlled through a card access system and are not made available to the general public. The actual number of spaces to be considered as shared will be determined at a later date.

4.4.3 Create Additional Parking Supply to Support the Project

A key element of the Prudential Center Redevelopment plan is to restrain the number of vehicle trips to the site by limiting the increases in parking supply. At the same time, there are a substantial number (533) of existing parking spaces that are not available until 9:30 AM to ensure an adequate reservoir for short-term parking at the Prudential Center. While this program is

extremely important to the functioning of the existing Prudential Center, it has become apparent, through the preparation of this analysis, that some increase in parking supply is needed to at least partially reduce the projected parking shortfall. Prior to implementing any mitigation efforts, an overall deficit of approximately 2,100 spaces was estimated previously in this document. With a successful mitigation program in place and applied to both the existing development and the proposed redevelopment project, the developer believes that this level of unmet parking demand can be reduced to approximately 1,400 spaces. When one considers that approximately 370 spaces are presently available and unused in the Prudential Center Garage on an average weekday, a serious shortfall in parking is still anticipated and a deficit of approximately 1,030 spaces is projected.

To address the projected shortage, there are two major parking supply opportunities available:

- o Increase parking in the existing Prudential Center Garage through the use of attendant or valet, stacked, tandem, and shared parking
- o Build a new or expanded facility off-site to serve the Hynes Convention Center

The first opportunity is already incorporated into the proposed project. A net total of approximately 800 additional parking spaces is provided within the Prudential Center Garage through use of the management techniques noted above.

The second major opportunity for providing additional parking spaces is for the Massachusetts Convention Center Authority (MCCA) to build a new off-site parking facility. The key reason for building a new or expanded facility off-site is to accommodate the parking needs generated by the Hynes Convention Center, which currently uses the Prudential Center Garage. Earlier in this report, it was estimated that the Hynes Convention Center generates 400 to 600 or more parkers in the Prudential Center Garage during a major event. This figure is exceeded occasionally when one considers that on the heaviest Hynes Convention Center days,

the garage fills and is closed to the public and many potential parkers are turned away by security personnel. To accommodate the Hynes Convention Center demand and the potential demand generated by the new development, two main options exist. Both options are discussed in detail in the Hynes Auditorium Draft EIR, Volume I, EOE #5046 (August 15, 1984).

The first option for additional parking off-site is for the MCCA to obtain a satellite parking lot of approximately 500 spaces to support the Hynes Convention Center. This option undoubtedly requires the provision of shuttle service between the remote parking facility and the Hynes Convention Center. The second option is to construct a new parking facility nearby, possibly on the triangular air rights parcel over the Massachusetts Turnpike and railroad adjacent to Dalton Street and the Cheri garage.

Representatives of the Prudential Property Company recently met with officials of the MCCA. Both parties jointly agreed to work cooperatively to address the Hynes Convention Center parking shortage. At this point, the MCCA is commissioning a feasibility study to examine the two options. It is expected that a more definitive plan will be presented in the Final Project Impact Report.

4.4.4 Provide Overnight/Weekend Parking for Area Residents at Reduced Rates

The developer is committed to providing area residents with a community benefit by providing overnight and weekend parking in the Prudential Center Garage at discounted rates. While the program has not yet been designed, it may be possible to tie this type of plan into the city's residential permit parking program.

Prudential's commitment to area residents is exemplified by a parking program implemented in the Prudential Center Garage from 1978-1982. This program offered residents two reduced rate plans: overnight parking seven days per week or overnight parking/all day weekend parking. The program was discontinued due to limited interest and participation,

despite extensive promotion. Since that time, Prudential has periodically offered reduced rate overnight parking for residents (e.g., during Back Bay clean-ups) and continues to do so.

4.4.5 Revise the Existing Parking Pricing Plan to Discourage All-Day Commuter Parking

A new pricing plan for the garage is generally implemented every January. In January 1989, daily transient parking charges in the garage increased \$1.00 to a maximum of \$15.00 per day. No "early bird" discount is provided and none will be established in the future. The Prudential Property Company's goal is to continue to price all-day parking in the garage at the upper boundary for this market area of the city to discourage all-day parking while trying to maintain short-term rates for shoppers at the lower end of the market. It is expected that on January 1, 1990 and in subsequent years, similar increases in all-day rates will occur.

4.4.6 Create a Parking System Directory and Upgrade Signage

As part of the Prudential Center Redevelopment, the developer intends to upgrade internal garage signage, starting with the North Garage in 1990 and the South Garage later as construction proceeds. Additionally, the Prudential Transportation Coordinator is responsible for developing a new parking system directory to orient users of the facility.

4.4.7 Provide Adequate Handicapped Parking

The Prudential Center Garage currently provides nineteen designated handicap parking spaces. Additional spaces will be added throughout the garage as the new parking management plan is implemented. The project is in full compliance with the Commonwealth's Architectural Access Board (AAB) standards for handicapped parking.

4.5 Access/Circulation Design

4.5.1 Simplify Boylston Street Frontage

The proposed Prudential Center Redevelopment includes reducing the amount of space dedicated to interior ring roads on Boylston Street. The new building program brings project buildings much closer to the street and eliminates the remainder of North Ring Road and its associated ramps. Two curb cuts are planned for the site: (1) a single new garage entrance/exit is proposed on Boylston Street at a point approximately 150-feet west of East Ring Road; and (2) a second curb cut to serve as a commercial/residential loading dock at a point 420-feet west of East Ring Road. The location of the garage entrance/exit is east of Fairfield Street, as requested by PruPAC members and area residents, to prevent exiting vehicles from leaving the site and traveling along Fairfield Street. Several options were considered and reviewed with the BTD and the BRA before the Boylston Street garage driveway location was selected. Based on its incompatibility with the existing garage structure, concern over traffic impacts on what is proposed to be only a 30-foot wide street, and impacts to street-level parking on Fairfield and Boylston streets, consideration of placing this access on East Ring Road was dropped.

4.5.2 Widen Huntington Avenue Approach to Belvidere and West Newton Streets by One Additional Travel Lane

The developer is proposing that Huntington Avenue westbound be widened by adding an additional right-turn lane between the Turnpike off-ramp and the intersection of Huntington Avenue with Belvidere and West Newton streets. This change is proposed to accommodate some of the traffic now using South Ring Road. The widening, to be accomplished at the developer's expense, creates more capacity and a longer vehicle storage area for the increase in volume expected on Huntington Avenue. It also eliminates the confusing nature of the existing South Ring Road traffic patterns and alleviates the difficulties faced by pedestrians crossing in this area.

4.5.3 Provide a Security Guard Responsible for Parking Enforcement along East Ring Road near the New Supermarket

This commitment is viewed as critical to ensuring smooth traffic flow along East Ring Road and will be implemented by the supermarket operation in cooperation with the developer.

4.5.4 Study the New Back Bay Turnpike Ramp Connections

The developer supports further study of the plans to provide an additional eastbound Turnpike access ramp and a westbound Turnpike exit ramp in the vicinity of Berkeley Street. The Massachusetts Turnpike Authority recently agreed to conduct an engineering feasibility study of these two new ramps, in addition to ongoing work on the Back Bay Transportation Study. The Prudential Property Company remains interested and supportive of both studies. It is anticipated that the studies will provide the information needed to clearly understand the advantages and disadvantages of these alternatives. Further, it is hoped that the traffic impact of these changes can be fully identified and evaluated.

4.6 Loading Improvements

4.6.1 Continue to Require all Deliveries to Off-Street Docks Only

The Prudential Property Company intends to continue its current policy of requiring all deliveries to be made to designated loading areas on the site. The city's current policy is to require off-street loading and it is Prudential's intention to continue to comply with this policy. The developer's interpretation of the number of loading docks required under current zoning by-laws is twelve to sixteen bays; however, the actual need is estimated at approximately eight bays. Furthermore, the fact that there currently are major loading areas on-site serves to mitigate the need for the full zoning requirement. To accommodate the proposed development, current plans include expanding the three major docks serving the Prudential Tower, 101 Huntington Avenue, and the existing supermarket. In addition, a new dock containing three loading bays is

proposed for the new supermarket. Further examination of the need to meet the zoning requirements is necessary. It is expected that more information on this topic will be provided in the Final Project Impact Report.

4.6.2 Delivery Time Restrictions to Off-Peak Hours

Implementing time restrictions on truck deliveries may be difficult to achieve, based on the unique mix of tenants on the site. While there may be difficulties in changing the current pattern of truck deliveries, the developer is committed to working with the Boston Transportation Department to better manage and control truck deliveries. The goal is to encourage midday, off-peak hour usage whenever possible.

4.6.3 Loading Improvements at the Existing Huntington Avenue and Belvidere Street Docks

With the construction of new development space on the site comes the opportunity to modify both of these existing loading areas. The redesign effort looks at ways in which the operation of the docks can be simplified with design changes. Further, it should be noted that the current use of these loading areas by all delivery vehicles, including courier services, will be continued. Other changes in the loading management plan will be made as necessary to ensure that the impact of trucks and delivery vehicles on the surrounding area is minimized.

4.7 Pedestrian Improvements

4.7.1 Upgrade Connections to the Orange Line and Commuter Rail at Back Bay Station and Area Green Line Stations

As mentioned previously, a major goal of the developer is to encourage use of the many public transportation resources in the area. This can be accomplished in part by simplifying access to these transit facilities through the creation of cleaner, safer, and more direct connections. These design elements are included with the planned construction of the project on

the south side of the site. When complete, pedestrians will have an easier, more direct route to public transportation with appropriate directional signage.

4.7.2 Provide Improved, Covered Pedestrian Walkways On-Site

The enclosure of the retail level and the creation of an indoor street concept as described in the Urban Design section of this report greatly improves conditions for pedestrians on the site.

4.7.3 Install Additional Pedestrian Warning Signs at Garage Entrances/Exits

A deficiency noted in the data collection phase of the project was the lack of warning signage for both drivers and pedestrians along and near the sidewalks circling the site. This condition is corrected in the proposed design by installing new signs throughout the garage over the next two years. In addition to installing warning signage, the new openings that serve the site's loading and parking areas are designed to maximize visibility for both drivers and pedestrians. The use of solid walls is discouraged and either a window-type treatment or notching of the corners is proposed.

4.7.4 Eliminate Pedestrian/Vehicle Conflicts by Eliminating South Ring Road and North Ring Road

This mitigation measure is described earlier in this section of the report. The key benefit of eliminating the westerly portion of South Ring Road is that it simplifies travel through the area and particularly benefits pedestrians who no longer have to contend with the conflicts at Ring Road and Belvidere Street intersection. Eliminating North Ring Road has major benefits for pedestrians as well, since conflicts with moving vehicles are projected to be greatly reduced.

4.7.5 Implement a Project-Wide Pedestrian Signage Program

A key element that ties many of the mitigation plan's physical components together is a project-wide pedestrian signage program. Signage is used for many reasons: to direct pedestrians to and from public transportation services; to guide pedestrians to major attractions on the site (such as the Hynes Convention Center); to improve accessibility to the Prudential Center Garage; and to guide shoppers to the project's retail establishments. The developer is committed to this mitigation plan since proper signage is an important element in ensuring the project's success.

4.7.6 Improve Pedestrian Lighting On-Site

The project is designed with dramatically improved lighting in the public and pedestrian areas. Pedestrian scale lighting is located an average of 90-feet on-center along all streets per the proposed Boylston Streetscape guidelines. Accent lighting is located an average of 30-feet on-center in all plazas, courtyards, and exterior project walkways for security and permitted evening use. Mounted lighting is located at all project and building entrances.

4.7.7 Improve Handicapped Access On-Site

The design plans for the project also include major improvements to on-site circulation. Throughout the site, there is a strong desire to develop a circulation pattern that is relatively barrier free, allowing free movement by individuals with physical disabilities. It was a challenge to develop these improved connections because of the many grade changes across the site; however, elevators and ramps are provided for barrier-free access throughout all interior and exterior spaces.

4.7.8 Continue to Paint Curbs to Improve Visibility

While a relatively minor mitigation measure, this program continues wherever possible to maintain the high visibility of the existing curbing and driveway openings. This effort to paint the curbing also makes pedestrians more aware of the crossing locations and improves safety.

4.7.9 Widen Painted Pedestrian Crosswalks

There are several locations on and off the project site which could be improved by painting wider and more visible pedestrian crosswalks. Specific locations considered were across streets, service, and garage entries. Along Boylston Street where service or parking lanes interrupt the pedestrian walkway, the driveway lanes are proposed to ramp up to meet the walkway elevation and will be paved with the same material as the walkway.

4.8 Construction Traffic Management

An important component of the Transportation Access Plan is the creation of effective measures designed to safely accommodate vehicular and pedestrian traffic flow during the project's construction. Summarized below are several measures that the developer and the construction contractors will incorporate into the construction traffic management plan and the construction mitigation agreement for the project. The developer will also assign a staff person to ensure the identified commitments are enforced.

4.8.1 Define a Construction Traffic Management Plan

A formal, master construction traffic management plan will be developed with the city. It will detail the specific commitments to be followed by the developer and the construction contractors throughout all phases of the project is construction and will be considered as a legally binding document.

4.8.2 Designate Truck Routes

Designated truck routes have been established to govern how trucks reach the site. The main point of this commitment is to have trucks use only major arteries and avoid using residential streets. In the area near the project, it is the developer's intention to keep trucks on the following streets:

- o Massachusetts Avenue
- o Boylston Street
- o Exeter Street (Boylston to Huntington only)
- o Huntington Avenue
- o Dalton Street
- o Belvidere Street
- o Stuart Street
- o St. James Avenue
- o Kneeland Street
- o Charles Street (Stuart to St. James only)
- o Berkeley Street (Southeast Expressway to St. James Avenue only)
- o Arlington Street (Stuart to Herald only)
- o Herald Street (Arlington to Southeast Expressway)

The truck routing plan described earlier in the document and highlighted here is designed to protect the Back Bay and South End residential areas. Trucks are not allowed to use any of the north-south streets between Boylston Street and Storrow Drive (except Massachusetts Avenue). Similarly, the plan is designed to protect pedestrians in the Copley Square area, since trucks are not allowed to use Dartmouth Street. Finally, no trucks are allowed on West Newton or Saint Botolph streets, protecting this residential neighborhood.

Enforcement of these restrictions will be accomplished through signage and contractual clauses in each contractor and subcontractor's agreement.

4.8.3 Provide Covered Pedestrian Walkways

Secure fencing, staging, and bracing are provided in areas affected by each phase of construction to protect nearby pedestrian and vehicular traffic, and to improve safety. Gate entrances into each construction area will be determined jointly with the BTB.

4.8.4 Provide Adequate On-Site Storage Areas for Construction Materials

The location of lay down and storage areas will be established to minimize area disruption and confusion. On the south side of the site, it appears that there will be a considerable amount of flexibility gained by eliminating South Ring Road and there will be adequate room to stage major elements of the construction. On the north side of the project, there will also be opportunities for the creation of these areas by eliminating North Ring Road. At this point, it appears that the need for the construction contractor to be physically located on city streets will be quite limited. The peripheral locations will also likely serve as staging areas for many of the more internal areas of the site where construction will be occurring. The movement of materials across the site will be carefully planned to avoid disrupting the adjacent business and residential tenants.

4.8.5 Encourage Construction Workers to Use Public Transportation

Construction workers will be encouraged to access the site by public transportation or ridesharing and, therefore, no special provisions are planned to accommodate the parking needs of construction workers on the site. It is planned that the construction contract agreements signed by the owner and the contractor will include specific language encouraging workers not to drive to the site. If workers choose to drive, they will not be permitted to park in the staging areas, rather, they will be required to park in the Prudential Center Garage and pay the full rates normally charged to the public. If carpools of construction workers are formed, they will be entitled to the same benefits that other carpools receive. At the same time, construction worker shifts will be scheduled to avoid impacts on the commuter rush hours as much as possible. With

the designated hours for construction between 7:00 AM and 3:30 PM, the traffic and transit impacts will occur during non-system peak hours, reducing project impacts.

4.8.6 Provide Truck Waiting Areas

Truck waiting areas will be designated to avoid creating impacts on adjacent and nearby residential areas. On the site, the North and South Ring Roads appear to provide opportunities for truck waiting to occur away from residential areas. Further, the use of an off-site truck marshalling area for major events such as large concrete pours will be investigated.

4.8.7 Provide Police Officer Traffic Management

Police officer traffic control may be necessary through most early phases of construction. The need for police officers will be determined jointly with the BTM and provided as required. Detail officers on assignment in the construction zone will be responsible for maintaining a safe and orderly flow of vehicles and pedestrians, as well as responding to any unforeseen events.

4.8.8 Provide Construction Graphics Program

The developer recognizes the potential impacts of construction on pedestrian circulation patterns through and around the site. To deal with this issue, the proponent is prepared to develop a graphics/signage program to direct pedestrians through the construction areas. The ongoing activities on the site must be allowed to continue in as unimpeded a fashion as possible. Keeping the Sheraton Hotel, the Hynes Convention Center, the residential buildings, the retail areas, and the existing office buildings all functioning with as little disruption as possible is an important goal of the project.

4.9 Traffic Operations

This section discusses potential mitigation measures that could be implemented to improve traffic operations at several intersections and along key corridors within the study area. Mitigation measures have been investigated for those locations expected to operate under

deficient levels of service in the future with or without the Prudential Center Redevelopment, and for those that currently operate deficiently. Additionally, a preliminary investigation of potential mitigation options to alleviate traffic in nearby neighborhoods has been conducted. The effect of operations improvements on intersection level of service is described in the Future Conditions section. Significant improvements in level of service at signalized intersections can be realized with traffic operations changes.

4.9.1 Massachusetts Avenue Corridor Improvement

A review of the intersection level-of-service summaries for the peak periods presented earlier indicates that there are several locations along Massachusetts Avenue which either have existing problems or are anticipated to decrease in operating efficiency, even without the proposed Prudential Center Redevelopment project. This is not surprising, given the current level of traffic on the road (2,000 vehicles during the evening peak hour), its status as a major north-south arterial through the city, and its high level of adjacent commercial and residential activity. These factors, combined with the need for genuine traffic relief in the area's residential neighborhoods, result in the necessity to deal with Massachusetts Avenue as a series of coordinated improvements along the corridor as opposed to individual intersection treatments. The coordinated approach would solve or reduce many individual problems.

Some time ago, the City of Boston took the first step in recognizing the importance of achieving improved traffic flow along Massachusetts Avenue when it prohibited left turns from that roadway onto several key crossing streets north of Huntington Avenue. South of Huntington, left-turn lanes were striped at several intersections, although restricted pavement width and parking lanes have reduced the benefits of that measure.

The concept of Massachusetts Avenue as a key arterial street could be expanded by the city through designation of the roadway as one of its Traffic Relief Program streets. This program has provided significant benefits on other important arterial streets such as Tremont Street, Congress Street, and Cambridge Street and is currently being considered for Boylston

Street. The concept should be extended to other major corridors such as Massachusetts Avenue. This approach would involve several measures such as the following:

- o Restrict curb parking during morning and evening peak periods and keeping all lanes open for travel between Storrow Drive and Melnea Cass Boulevard at the Southeast Expressway.
- o Retain and possibly extend left-turn prohibitions to include additional intersections.
- o Assign traffic control officers at key intersections such as Newbury Street, Boylston Street, and Columbus Avenue to ensure smooth traffic flow.
- o Implement a vigorous enforcement program, including towing.
- o Restripe lanes, particularly south of Huntington Avenue, to reallocate the available pavement width in the most efficient way.
- o Adjust signal phasing and timing accordingly. Signal control modifications, including peak period progression, should be implemented in coordination with the city's computerized signal system now being installed.

Recognizing that this recommendation may be more suitable for long-term implementation due to the city's priorities and budget constraints, several key target areas should be considered for an initial improvement plan along Massachusetts Avenue. While not providing the full benefits of a corridor-level improvement program, these provide interim relief in the targeted areas. Elements of this Phase 1 effort include the following:

- o Restrict parking on the southbound side of Massachusetts Avenue from Huntington Avenue to Columbus Avenue in the evening peak period
- o Restrict parking on the Westland Avenue approach to Massachusetts Avenue in the morning peak period

- o Improve signage for the southbound left-turn lane on Massachusetts Avenue approaching Columbus Avenue
- o Restripe Newbury Street at Massachusetts Avenue to clearly provide two travel lanes and provide traffic officer control at the intersection to: (1) eliminate illegal left-turns from Massachusetts Avenue to the Massachusetts Turnpike westbound on-ramp, and (2) prevent double-parking on Newbury Street at the intersection
- o Prohibit all loading and deliveries on Massachusetts Avenue during peak hours
- o Relocate near-side bus stops as appropriate to the departure side at area intersections
- o Commit the necessary enforcement staff and equipment to ensure the success of the measures

4.9.2 Residential Neighborhood Protection

The Massachusetts Avenue program by itself goes a long way in reducing traffic intrusions into adjacent neighborhoods. By improving traffic flow along Massachusetts Avenue, the program reduces the congestion that causes many drivers to use alternative routes through the neighborhoods. In coordination with the Massachusetts Avenue improvement program described above, however, several additional measures could be undertaken to further ensure a reduction in traffic intrusion. One such measure involves reducing commuter traffic on West Newton Street by posting a DO NOT ENTER BETWEEN 3 PM AND 6 PM sign at Huntington Avenue. This prevents all traffic from entering West Newton Street from Huntington Avenue. Neighborhood residents would still be able to access West Newton Street via Garrison and St. Botolph streets. Bypass traffic would not likely use this circuitous route, but would be attracted to the improved Massachusetts Avenue corridor, which should be the primary route to access the regional highway system. This approach would result in less traffic on West Newton and St. Botolph streets and improved level of service at the intersection of Columbus Avenue and West Newton Street. Operational benefits would also occur at the intersections of Huntington Avenue

and West Newton Street; and Columbus Avenue, West Newton Street, and Belvidere Street, principally because of the elimination of westbound left turns.

Back Bay neighborhood traffic reductions north of Boylston Street could be gained by implementing the Traffic Relief Program route currently proposed for the Boylston and Essex corridor. In the Back Bay, this program focuses on eliminating double-parking, which at times significantly reduces the capacity of Boylston Street. Improving the Boylston Street corridor would encourage drivers to stay on the main thoroughfare and avoid seeking shortcuts through the Back Bay neighborhood. The Back Bay Transportation Study currently being conducted by the city is also considering additional measures to reduce travel on neighborhood streets. One such measure, involving the closure of the Dartmouth Street off-ramp from Storrow Drive, has already been implemented.

There are several other mitigation measures that are expected to reduce traffic in the Back Bay. For the long-term, new Massachusetts Turnpike ramps are proposed for the Back Bay. The proposed eastbound on-ramp and westbound off-ramp provides an improved connection between the Back Bay, I-93, and downtown Boston via the Massachusetts Turnpike. These ramps divert traffic from the Back Bay by providing a more direct route for drivers headed to the north and south. Drivers can travel on the Massachusetts Turnpike eastbound and access the reconstructed Central Artery (I-93 north) and new Third Harbor Tunnel. This will likely reduce the amount of traffic that would otherwise access Storrow Drive via the on-ramp at Berkeley Street. The Turnpike ramps also reduce the amount of traffic using Massachusetts Avenue to access the Southeast Expressway (I-93 south).

In the short-term, there are two additional mitigation measures that could reduce traffic on certain Back Bay streets. One option is to make Boylston Street a two-way between Dalton Street and East Ring Road. This allows drivers from the Prudential Center to travel west on Boylston Street to access Storrow Drive via the ramps at Charlesgate. Under the existing street pattern, westbound vehicles would likely travel via Dartmouth Street and Beacon Street to reach Storrow Drive. Another mitigation option is to reverse the direction of Dartmouth Street north of Boylston Street to permit travel only in the southbound direction. This would not likely reduce

the total amount of traffic in the Back Bay, but would force more vehicles to use Berkeley Street to reach Storrow Drive. These options, along with others, should be investigated in the Back Bay Transportation Study where they can be properly evaluated with regard to the overall traffic pattern throughout the Back Bay.

4.9.3 South End Neighborhood Street Traffic Protection

During the preparation of this document, an issue regarding the protection of South End neighborhood streets was raised. Residents of these streets, which are generally in the area bounded by Massachusetts Avenue, Tremont Street, Dartmouth Street and Huntington Avenue have expressed their concern that traffic growth on neighborhood streets be minimized. The concern is not just with the traffic that would be generated by the Prudential Center Redevelopment but also with traffic generated by all other development in the area.

To address this issue, potential improvements for the Massachusetts Avenue and West Newton Street corridors have been identified. More detailed analyses of other streets, however, was not specifically addressed in the scope of services prepared by the BRA for the Prudential project. Nevertheless, the issue of traffic diversions and impacts throughout the South End has been recognized.

Probably the most effective way to critically examine traffic patterns in the South End neighborhood would be through a comprehensive neighborhood transportation study. The City's Transportation Department has conducted a number of such efforts throughout Boston, including the neighborhoods of South Boston, Beacon Hill, East Boston and Charlestown. It is suggested that a similar effort be undertaken for the South End neighborhood to carefully examine the area's traffic patterns. Such a study would consider the potential to restrict or reduce traffic on neighborhood streets, particularly commuter traffic. The study should examine closing streets, reversing the directions of flow, implementing turn restrictions or new one way designations, and other measures to discourage travel along neighborhood streets. In addition, improvements to major through routes should be examined to improve flow and encourage

through traffic to remain on major arterials. Finally, such a study should consider strategies to reduce traffic demands from major generators within or adjacent to the area. The Prudential Property Company strongly supports the City's efforts to conduct such a study.

4.9.4 Other

The various measures identified above address existing or projected deficient level-of-service conditions at all identified locations, except the intersection of Huntington Avenue, Exeter Street, and Stuart Street. This intersection can be improved operationally by implementing the following mitigation measures:

- o Restripe Exeter Street to provide an exclusive left-turn lane, a shared through/left-turn lane, and a right-turn lane
- o Enforce parking regulations to prevent double-parking, particularly along the Exeter Street approach
- o Redefine crosswalks to improve pedestrian safety and reduce pedestrian crossing times

4.10 General

4.10.1 Support the Back Bay Transportation Study

The developer strongly supports the city's efforts on the Back Bay Transportation Study and feels that it provides a useful framework for improving transportation conditions throughout the area. It is important to note that the Prudential Property Company has already provided approximately \$75,000 worth of support to this effort.

4.10.2 Support Increased Enforcement of Existing Traffic and Parking Regulations

Another area where the developer strongly supports the city's efforts is in the area of increased enforcement of the posted traffic and parking regulations. As identified earlier in this study and in the early phases of the Back Bay Transportation Study, illegal traffic and parking activities are substantial at certain locations within the project area. There is a strong need to address these problems. The city's Transportation Department (BTD) plans to increase enforcement in the Back Bay, most notably stepped-up enforcement against illegal double-parking along Boylston Street which will take place this spring. The Prudential Property Company strongly supports any and all efforts made by the city to increase enforcement of traffic and parking regulations. The developer has been requested by the BTD to assist in the funding of increased enforcement levels and has agreed, in principle, to do so. Details of this agreement will be included in the Transportation Access Plan (TAP) agreement between the BTD and the Prudential Property Company, Inc.

4.10.3 Participate in the BTD's "Keep Boston Moving" Campaign

The Prudential Property Company has agreed to contribute approximately \$30,000 to assist the city's efforts in the "Keep Boston Moving" campaign. The contribution will be used to prepare commuter mobility maps that will be distributed free-of-charge to Prudential Center visitors, employees, and shoppers. As discussed earlier, these maps will provide information on public transportation options available to travel to and from the site.

4.10.4 Provide Neighborhood Parking during City-Designated Snow Emergencies

The Prudential Property Company will work cooperatively with the Boston Transportation Department (BTD) to implement a snow emergency parking program. A similar program was available at the Prudential Center in the past, but was discontinued many years ago. Discount overnight parking for neighborhood residents on declared snow emergency days will also be part of the plan. It is expected that verification of each parker's status will be based on the existence of a resident permit parking sticker on cars belonging to the Prudential Center's residential neighbors.

4.10.5 Monitoring Program

In the Probable Project Impacts section, detailed estimates of the amount of vehicle-trip generation were made, based on several combined factors. The most significant factors affecting the number of vehicle trips to the Prudential Center are the percentage of automobile use versus transit/walk use and vehicle occupancy rate. The percent of trips arriving during the peak travel hour is not expected to be a significant factor at the Prudential Center since there is already considerable staggering of work hours.

To minimize the amount of automobile travel to the site, it is desirable to increase the number of trips by public transportation and to increase the vehicle occupancy rate of those vehicles traveling to the site. These factors serve as a basis for establishing a set of access goals for the redevelopment project.

Table III-70 lists the trip generation factors, along with the values assumed for project-generated trips in the earlier section of this document. The factors focus on work trips, which constitute the majority of the project's new vehicle- and transit-trip generation during the peak commuting hours. Changes in the value of each factor may be considered as measures of effectiveness for the proposed mitigation actions. The top portion of the table lists the numerical values of the two key factors used in the unmitigated analysis and the revised factors, which assumes the mitigation program is in place. The lower part of the table shows both the originally expected, net new traffic generation and the revised estimate, which assumes the mitigation plan is in place.

TABLE III-70
ACCESS GOALS

	Unmitigated Analysis <u>Estimate</u>	Mitigation <u>Action</u>	Mitigation <u>Goal</u>
<u>Trip Generation Factors</u>			
Percent by Transit:			
Office Employees	47%	Transit Incentive	52%
Vehicle Occupancy Rate:			
Office Employees	1.5	Ridesharing	1.8
Retail Employees	1.4		1.6
Hotel Employees*	1.3		1.6

Resulting Net New Peak Hour Trips

Vehicle Trips:		
Morning In	575	327
Evening Out	623	375
Transit Trips:		
Morning In	978	1,207
Evening Out	1,103	1,332

* For existing use only.

As indicated in the table, mitigation measures reduce project-generated vehicle trips in the peak direction by approximately 250 vehicles (43 percent) in the morning peak hour and 250 vehicles (40 percent) in the evening peak hour. Transit trips increase by about 230 trips in the morning peak hour (23 percent) and 230 trips in the evening peak hour (21 percent).

As a follow up to the setting of the access goals listed above, the developer is prepared to provide annual management reports to the city on the project's compliance with the stated goals and objectives, as well as other areas of the access plan. To accomplish this, the proponent will annually conduct a survey of employees, visitors, shoppers, and residents of the site. These surveys will be used to assist in determining trip generation rates, travel mode splits, vehicle occupancy rates, peak hour travel percentages, and parking data. Additionally, data on trip

origins and destinations will be gathered as part of the survey work. This data will be collected after consultation with the BT&D and in accordance with the BT&D's guidelines.

The developer also commits to working with the city to address any other transportation related issues affected by the project.

